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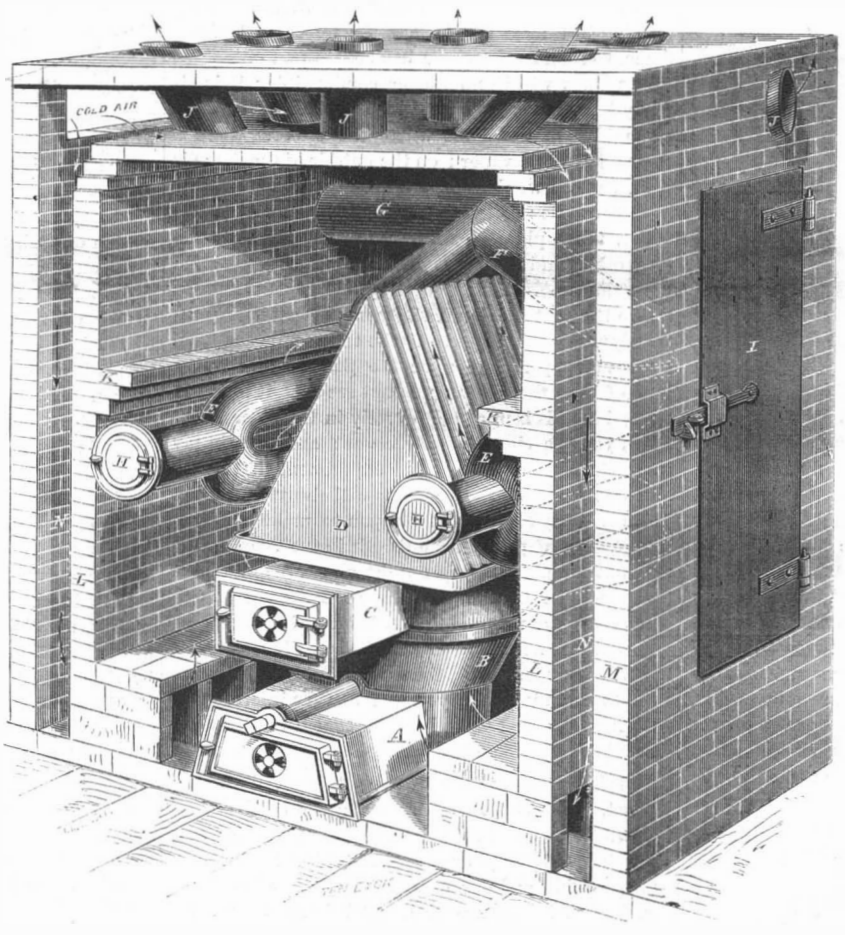
Improved Hot Air Furnace.

The accompanying engraving represents an alleged improvement in furnaces for warming dwellings with hot air, designed by A. H. Bartlett, of this city. The inventor has long been engaged in manufacturing and selling furnaces, and his aim in devising this was, not to advance a startling novelty, but to so combine the modifications suggested by experience as to produce an economical and convenient furnace, one that should utilize all the heat, be easily managed by an unskillful servant, and afford the greatest possible facilities for cleaning and repairs.

The engraving represents the furnace set in its hot air chamber of brick work, with the front wall of the chamber removed in order to show the parts. A is the ash pit, B the fire pot, C the feeder, D the cast iron corrugated radiator, E E the flues, H H doors for cleaning the flues, F the connecting pipe, G the smoke pipe, I the manhole door, K K projections in the brickwork to turn the air inward around the flues, J J J J hot air pipes, L the inner wall of the air chamber, M the outer wall and N the space between the two.



BARTLETT'S IMPROVED HOT AIR FURNACE.

The fire pot, B, being supplied with coal through the feeder, C, the radiator and flues become heated, and thus warm the air chamber. The cold air enters through an opening in the outer wall as indicated by the arrows, and, passing around the inner chamber, enters through openings in the bottom in a horizontal direction, so as to be thrown directly against the furnace. As it rises it is deflected inward by the projections, K K, against the flues, and lastly against the upper part of the radiator, D, which is the hottest portion of the furnace. This is an important feature in this invention; as the air can become progressively heated only by coming first in contact with the cooler parts of the furnace, and lastly with those which are the hottest.

The flues are made in pieces of moderate length, and their joints, as well as all others in the furnace, are deep sand joints, thus giving perfect security against the leakage of air or smoke. The flues do not descend in any part of their course, and from their size and position they are very easily cleaned. No piece of the whole furnace is too heavy to be removed by one man in case of repairs being required.

The patent for this invention was granted Sept. 18, 1860, and further information in relation to it may be obtained by addressing Bartlett & Lesley, at No. 426 Broadway, New York.

A CUBIC inch of gold is worth one hundred and forty-six dollars; a cubic foot, two hundred and fifty-two thousand, two hundred and eighty-eight dollars; and a cubic yard, six million, eight hundred and eleven thousand, seven hundred and seventy-six dollars. The quantity of gold now in existence is estimated to be three thousand millions of dollars, which, welded in one mass, could be contained in a cube of twenty-three feet.

Why Does Gunpowder Drive a Ball from a Cannon?

When gunpowder is burned, the elements of which it is composed are changed from the solid to the gaseous form, and, as gases, they occupy some three or four hundred times more bulk than they do in the solid state at the same temperature. But the substances, at the same time that they are changed into gases, are intensely heated, and by this means their volume or pressure is still more augmented. Various statements have been made in relation to the amount of pressure produced by the burning of gunpowder, but the best experiments that we have seen any account of were made by some of the officers of our army. Little cylinders furnished with solid pistons, and containing oil, were inserted in the metal of the gun, opening at right angles into the bore, so that the pressure of the gases would drive in the piston, compressing the oil. An arrangement was made by which the piston marked the distance to which it was forced into the cylinder, thus registering the compression. The force required to compress the oil to the same extent was afterwards ascertained by means of a lever and weight. The pressure in the several parts of the bore was thus measured, and was found to be about 25,000 lbs. to the square inch near the breech and to diminish rapidly towards the muzzle.

Gunpowder is composed of three substances—saltpeter, sulphur and charcoal. Saltpeter is the nitrate of potash, its constituents being nitrogen, oxygen and potassium. In the best gunpowder, the ingredients are so mixed that the composition consists of one atom of potash to one of nitric acid, three of carbon and one of sulphur (KO, NO_5+C_3+S), and, by explosion, this is changed into $KS+N+3CO_2$, that is, one atom of sulphuret of potassium, one of nitrogen and three of carbonic acid. In this change 100 parts by weight yield 59 parts by weight of gas (nitrogen and carbonic acid); the other 41 parts being solid sulphuret of potassium. The increase of volume in this case is 300 for 1 at the same temperature, and the increase of temperature is variously conjectured, from 2,000° to 5,000° Fah.

The Origin of Coal Oil.

At a meeting of the Manchester Geological Society, Nov. 20, 1860, Mr. E. W. Binney, F.R.S., F.G.S., read a paper on "Dorin Holland Moss," in which he discussed at length the origin of coal oil. His views coincide exactly with those of Dr. Stevens, published on page 370 of the last volume of the SCIENTIFIC AMERICAN, and these views were generally supported by the Society in the discussion which followed. After considering and rejecting other explanations of the origin of the coal oil, Mr. Binney says: "These circumstances led to the conclusion that it is produced by the decomposition of the upper bed of peat, where it is overlaid by the sand."

Mr. Dickinson, F.G.S., said that it was not at all uncommon to observe mineral pitch or petroleum oozing from a stratum of coal in our pits, distillation having taken place in the bed where external heat could have no influence.

Mr. Binney stated that "Petroleum or rock oil is found in various parts of the world—in the Burman empire, on the banks of the Irawaddi, are powerful springs of it; it is abundant in Persia; it occurs in Barbadoes; at Tegernsee, in Bavaria; in Auvergne, near Claremont; in Switzerland, near Neufchatel; at Amiano, in Italy; and in Sicily; and near the volcanic isles of Cape de Verde the sea is sometimes covered with it."

It will be remembered that Dr. Stevens' explanation of the origin of the coal oils was, that the coal or other carbonaceous deposit is decomposed by the operation of natural forces, producing results similar to those which occur when coal is distilled in a retort for the artificial manufacture of oil. Some difference of opinion was expressed by the members of the Manchester Society, in regard to the necessity of external heat to effect the decomposition of coal. Some geologists believe that the decomposition takes place spontaneously from the natural disposition of the elements of organic compounds to fall asunder.

TIME AND PHOTOGRAPHY.—Sun pictures may be taken in various modes, some requiring several minutes and others only an instant. Photographs of rapidly moving objects, as race horses, the waves of the sea, &c., are taken in the hundredth part of a second. In English experiments, an image was taken in the ten-thousandth part of a second; and a rapidly revolving wheel was taken in so brief a space that it seemed perfectly well defined and stationary, being illuminated by a single discharge of an electric battery, occupying, according to Wheatstone, only the millionth part of a second.

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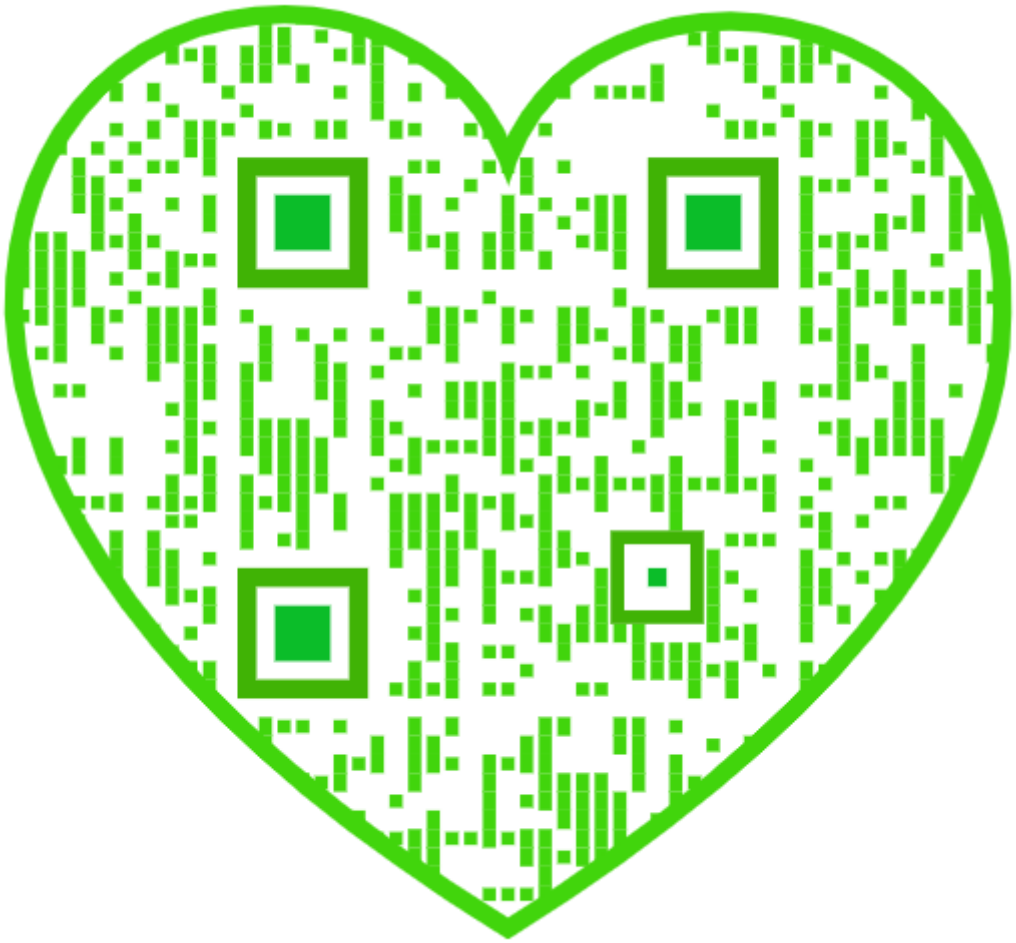


THE CHEMICAL HISTORY OF A CANDLE.

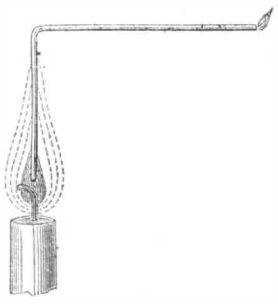
By Professor Faraday.

A Course of Six Lectures (adapted to a Juvenile Audience) Delivered before the Royal Institution of Great Britain.

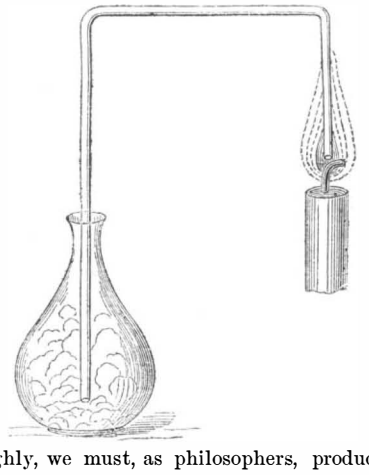
LECTURE II.

A Candle; Brightness of the Flame—Air Necessary for Combustion—Production of Water.

We were occupied, the last time we met, in considering the general character and arrangement as regards the fluid portion of a candle, and the way in which that fluid got into the place of combustion. You see, when we have a candle fairly burning in a regular, steady atmosphere, it will have a shape something like the one shown in the diagram, and looking pretty uniform, although very curious in its character. And, now, I have to ask your attention to the means by which we are able to ascertain what happens in any particular part of the flame; why it happens; what it does in happening; and where, after all, the whole candle goes to: because, as you know very well, a candle being brought before us and burned, disappears, if properly burned, without the least trace of dirt in the candlestick—and this is a very curious circumstance. Now, in order to examine this candle carefully, I have arranged certain apparatus, the use of which you will see as I go on. Here is a candle; I am about to put the end of this glass tube into the middle of it—into that part which old Hooker has represented in the diagram as being rather dark, and which you can see at any time if you will look at a candle carefully, without blowing it about. We will examine this dark part first.



Now I take this bent glass tube, and introduce one end into that part of the flame, and you see at once that something is coming from the flame, out at the other end of the tube; and if I put a flask there, and leave it for a little while, you will gradually see that something from the middle part of the flame is drawn out and goes through the tube and into that flask, and there behaves very differently from what it does in the open air. It not only escapes from the end of the tube, but falls down to the bottom of the flask, like a heavy substance, as indeed it is. We find that this is the wax of the candle converted into a vaporous fluid—not a gas. You must learn the difference between a gas and a vapor; a gas remains permanent—a vapor is something that will condense. If you blow out a candle, you perceive a very nasty smell consequent on the condensation of this vapor. This is very different from what you have outside the flame; and in order to make it more clear to you, I am about to produce and set fire to a larger portion of this vapor—for what we have in a small way in a candle, to understand



thoroughly, we must, as philosophers, produce in a larger way if needful, that we may examine the different parts. And, now, Mr. Anderson will give me a source of heat; and I am about to show you what that vapor is. Now, here is a glass flask, and I am going to make it hot, as the inside of the candle flame is hot, and the matter about the wick is hot. [The lecturer placed some pieces of wax in a glass flask and heated them over a lamp.] Now, I dare say, that is hot enough for me. You see that the wax I put in it has become fluid, and there is a little smoke coming from it. We shall very soon have the vapor rising up. I will make it still hotter, and now we get more of it, so that I can actually pour the vapor out of the flask into that basin, and set it on fire there. This, then, is exactly the same kind of vapor as we have in the middle of the candle; and that you may see that that is the case, let us try whether we have not got here, in this flask, a real combustible vapor out of the midddle of the candle—[taking the flask into which the tube from the candle proceeded, and introducing a lighted taper]. See how it burns. Now this is the very vapor from the middle of the candle, produced by its own heat; and that is one of the first things you have to consider with respect to the progress of the wax in the process of combustion, and as regards the changes it undergoes. I will arrange another tube carefully in the flame, and I should not wonder if we were able by a little care, to get that vapor to pass through the tube to the other extremity, where we will light it and obtain absolutely the flame of the candle at a place different from it. Now, look at that. Is not that a very pretty experiment? Talk about laying on gas—why, we can actually lay on a candle! And you see from this that there are clearly two different kinds of action—one the *production* of the vapor, and the other the *combustion* of it—both of which take place in particular parts of the candle.

I shall get no vapor from that part that is already burnt. If I raise the tube to the upper part of the flame, so soon as the vapor has been swept out, what comes away will be no longer combustible; it is already burned. How burned? Why burned thus: In the middle of the flame where the wick is, there is this combustible vapor; on the outside of the flame is the air which we shall find necessary for the burning of the candle; between the two, intense chemical action takes place whereby the air and fuel act upon each other, and at the very same time that we obtain light the vapor inside is destroyed. If you examine where the heat of a candle is, you will find it very curiously arranged. Suppose I take this candle and hold a piece of paper close upon the flame, where is the heat of that flame? Do you not see that it is not in the inside? It is in a ring, exactly in the place where I told you the chemical action was; and even in my irregular mode of making the experiment, if there is not too much disturbance, there will always be a ring. This is a good experiment for you to make at home. Take a strip of paper, have the air in the room quiet, and put the piece of paper right across the middle of the flame (I must not talk while I make the experiment), and you will find that it is burnt in two places, and that it is not burnt, or very little so, in the middle and when you have tried the experiment once or twice, so as to make it nicely, you will be very interested to see where the heat is, and to find that it is where the air and the fuel come together.

This is most important for us as we proceed with our subject. Air is absolutely necessary for combustion; and what is more, I must have you to understand that *fresh* air is necessary, or else we should be imperfect in our reasoning and our experiments. Here is a jar of air, I place it over a candle, and it burns very nicely in it at first, showing that what I have said about it is true; but there will soon be a change. See how the flame is drawing upward, presently fading, and at last going out. And going out, why? Not because it wants air merely, for the jar is as full now as it was before; but it wants pure air, fresh air. The jar is full of air partly changed, partly not changed; but it does not contain sufficient of the fresh air which is necessary for the combustion of a candle. These are all the points which we, as young chemists, have to gather up; and if we look a little more closely into this kind of action, we shall find certain steps of reasoning extremely interesting. For instance, here is the oil lamp I showed you—an excellent lamp for our experiments—the old Argand lamp. I now make it like a candle [obstructing the passage of air into the center of the flame]; there is the cotton; there is the oil rising up it; and there is the conical flame. It burns poorly because there is a partial restraint of air. I have allowed no air to get to it, save round the outside of the flame, and it does not burn well. I cannot admit more air from the outside, because the wick is large; but if, as Argand did so cleverly, I open a passage to the middle of the flame, and so let air come in there, you will see how much more beautifully it burns. If I shut the air off, look how it smokes; and why? We have now some interesting points to study: we have the case of the combustion of a candle; we have the case of a candle being put out by the want of air; and we have now the case of imperfect combustion, and this is to us so interesting, that I want you to understand it as thoroughly as you do the case of a candle burning in the best possible state. I will now make a great flame, because we need the largest possible illustrations. Here is a larger wick [burning turpentine on a ball of cotton]. All these things are the same as candles, after all. If we have larger wicks we must have a larger supply of air, or we shall have less perfect combustion. Look now at this black substance going up into the atmosphere; there is a regular stream of it. I have provided means to carry off the imperfectly-burnt part, lest it should annoy you. Look at the soots that fly off from the flame; see what an imperfect combustion it is, because it cannot get enough air. What, then, is happening? Why, certain things which are necessary to the combustion of a candle are absent, and very bad results are accordingly produced; but we see what happens to a candle when it is burnt in a pure and proper state of air. At the time when I showed you this charring by the ring of flame on the one side of the paper, I might also have shown you, by turning to the other side, that the burning of a candle produces the same kind of soot—charcoal or carbon.

But, before I show that, let me explain to you, as it is quite necessary for our purpose, that, though I take a candle and give you, as the general result, its combustion in the form of a flame, we must see whether combustion is always in this shape—when I say "shape" I mean condition—or whether there are other conditions of flame; and there are, and they are most important to us. I think perhaps the best illustration of such a point as that, being young ones, is to give you the result of strong contrast. Here is a little gunpowder. You know that gunpowder burns with flame; we may fairly call it flame. It contains carbon and other materials, which altogether cause it to burn with a flame. And here is some pulverized iron, or iron filings. Now, I purpose burning these two things together. I have a little mortar in which I will mix them. (Before I go into these experiments, let me hope that none of you, by trying to repeat them for fun's sake, will do any harm. These things may all be very properly used if we take care, but, without that, much mischief will be done.) Well, then, here is a little gunpowder, which I put at the bottom of that little wooden vessel, and mix the iron filings up with it, my object being to make the gunpowder set fire to the filings and burn them in the air, and thereby show the difference between substances burning with flame and not with flame. Here is the mixture, and when I set fire to it you must watch the combustion, and you will see that it is of two kinds. You will see the gunpowder burning and the filings thrown up. You will see them burning too, but you will see them burning otherwise than in flame. They will each burn separately. [The lecturer then ignited the mixture.] There is the gunpowder which burns with a flame, and there are the filings; they burn with a different kind of combustion. You see, then, these two great distinctions; and upon these differences depend all the beauty and all the utility of flame which we use for the purpose of giving out light. When we use oil, or gas, or candle, for the purpose of illumination, their fitness all depend upon these different kinds of combustion.

There are such curious conditions of flame that it requires some sharpness and some cleverness to distinguish the kinds of combustion one from another. For instance, here is a powder which is very combustible, consisting, as you see, of separate little particles. It is called *lycopodium*, and each of these particles can produce a vapor and produce its own flame; but, to see them burn, you would think it was all one flame. I will now set fire to a quantity, and you will see the effect. We saw a cloud of flame, apparently in one body; but that rushing sound [referring to the sound produced by the burning] was a proof that the combustion was not a continuous or regular one. This is

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the lightning of the pentomimes, and a very good one too. [The experiment was twice repeated, by blowing lycopodium from a glass tube through a spirit flame.] That is not a combustion like that of the filings I have been speaking of, to which I must now bring you back again.

[To be continued.]

Hard India-Rubber.

The following is another very interesting article on this subject from the London *Mechanics' Magazine*, as a continuation of the essay on page 67, present volume, SCIENTIFIC AMERICAN :—

The value of hard india-rubber has never been doubted by any who have given it their attention. In the United States, where they are far ahead of us, large factories have been erected *for its manufacture alone*, and you come into daily, almost hourly contact with vulcanite or bone rubber—one of their names for it—at every turn and in every form. The heels of your boots are made of it; the buttons on your vests, coats, and trousers are india-rubber; your jewelry is mounted with it. The handles of the knifes in imitation of buckhorn, and at a quarter of the price, to say nothing of their much greater durability; the rings round the napkins, the cane you carry, your brushes and combs, soap-dishes and other utensils, are all made from it; and your easy chair rolls on castors of the same material. When we see our sharp-witted and cute American cousins thus awake to its value, we may rest assured there is something in it.

The india-rubber trade generally has received more attention there than here—more capital has been brought to bear upon it, their factories are larger, and their machinery better. With the exception of the manufactory of Messrs. Charles Macintosh & Co., there have been none started in this country until within the last few years, and these only on a comparatively small scale, or simply devoted to the making of waterproof garments. The trade, as far as the exercise of inventive genius in its application to new purposes is concerned, has been at a standstill, and the manufacture of hard india-rubber is only now being begun.

Goodyear's introduction of it into this country did not lead to any practical results, from the fact that he had no manufactory; all the beautiful specimens he exhibited were the product of American skill. This of course rendered their cost too high either as substitutes or improvements upon anything in use. Had he lived we believe it was his intention to have established large works here, which would doubtless have led to great results, but his death prevented this, and its development is left to other hands.

Till very recently all the articles made from hard india-rubber have been imported from America, France, or Belgium—large factories being established in the two latter countries for the production of combs and other goods. The importation of this one article into England amounts to a sum that would astonish any one ignorant of the large amount of trade done in combs generally. One house alone we believe imports £10,000 worth annually. This state of things, however, we do not suppose will long exist. It has been caused to a great extent by the fact of the manufacture itself being a secret; and the cause of failure in those who have attempted to produce it has arisen from an ignorance of the nature of the process and the principles by which it is governed.

The chemistry of india-rubber, or rather of its manufacture, would form an interesting volume, which we should like to see published; and we hope some future Goodyear may yet give us the result of new experiments and point out new facts in its history. As we stated in our first article, we know of no material which has been introduced of late years which contains in itself so many elements of wonderful adaptability to such numerous purposes. We have therefore faith in its future; that what we have already admired and wondered at, is yet destined to work many further important changes, and be turned, by the application of inventive and studious minds, into other and still more useful channels.

The great waste which attended the manufacture of india-rubber at first, and indeed until very recently, has now been done away with by a recent patent. Vulcanized rubber is submitted to a process by which it is *recovered* and made capable of re-use; Goodyear's belief that the old overshoes instead of being thrown away when worn out would be saleable to the old clothesmen has come true, and the piles of what was formerly considered worthless rubbish have, like the cinder heaps, become little banks of riches. The facility with which india-rubber may be molded, and the delicate patterns which may be impressed on its surface, render it far before any other material, more particularly on account of its elasticity under blows which would utterly annihilate a more fragile substance. A sheet of hard india-rubber with the finest raised pattern impressed on its face during the process of vulcanization may be struck with a heavy hammer without marring in the least its beauty. This renders it eminently adapted for panels, for ornamental work, carriages and other purposes.

The ready admixture of india-rubber with other gums also allows many things to be advantageously joined with it without injuring the consistence of the mass, and permits the production of various articles which are not required of a fine quality, at a much less cost than would otherwise be possible.

Amongst the most recent appliances of hard or semi-hard india-rubber we may mention the following as the most important to which our attention has been drawn: Shuttles, spools, bobbins, bosses, and covered rollers; army accouterments and ornaments; musical instruments, such as fifes and piccolos; knife, sword and pistol handles, and pens. Insulators for telegraphic wires we have previously mentioned, but we may add that these have been used in the United States for many years past with perfect success. With reference to its application to machinery in the instance of shuttles, bobbins, &c., its advantages are very great. Hard wood, which has hitherto been used for this purpose, is liable to split and warp, indeed is of common occurrence. The india-rubber not being subject to this renders it of great value. This also applies equally to the *bosses* used in flax spinning, which are being supplanted by india-rubber as far more durable. Its application, however, to the coating of iron rollers where equal pressure with a certain amount of *elastic resistance* is required, bids fair to become of very great value, nothing having been yet found to meet this requirement. Army accouterments and ornaments excel those in present use from their extreme lightness, and from the resistance to blows which would indent metal, as well as from the facility with which they may be cleaned. As applied to flutes, fifes, or piccolos it is far superior to wood, from its being unaffected by heat or cold, moisture or dry weather. The fifes and flutes we have seen are perfection in appearance, and their tone remarkably clear without being hard or loud, arising no doubt from the peculiar non-porosity of their substance, and the beautiful surface given to their interior in the process of manufacture. As handles to ordinary knives, pistols, or swords, there is a superiority over anything hitherto used, both in touch and wear, the blades not being liable to start when placed in hot water, as is so commonly the case with bone or ivory—whilst its application to pens will doubtless ere long be as common as steel, combining as its does all the qualities of the metal with the extreme freedom and ease of the quill. Hard india-rubber had also been applied to the coating of iron pins for insulators, the covering of gun-barrels in place of *browning*, and the coating of harness irons in place of leather, being found far more durable, not affected by heat or wet, and requiring far less trouble in cleaning.

The treatment which the native india-rubber has to undergo in its manufacture and the machinery used varies according to the different requirements of manufacturers, but we may glance at the process of cleansing and mastication, which is necessarily much the same in all factories, as showing the great strength of the material and the power required to tear it asunder and rework it into one consistent mass. We have stated in a former article that the gum as imported is very largely mixed with clay, bark, and other things, which have to be removed before it can be worked into any article of commerce. This process consists of the cutting by a knife, into small pieces, the blocks or bottles of rubber, and then, after soaking them for some time in hot water, placing them in a closed cylinder with revolving spikes or teeth, which tear it into shreds, and allow a stream of water, which passes through the machine, to wash away all the dirt and impurities. This action being continued for some time, generates sufficient heat in itself to make the whole adhere in one mass, which is then taken out, and subjected to other machines, where it may be rolled into sheets, or shaped in any way the most convenient for storage. The gum thus prepared is ready for solution or grinding with sulphur, colors, or other admixture that may be required. The power that is necessary to turn one of these machines is very great, and the strength of the grinders in proportion, their size varying according to the extent of the factories in which they may be used, some being capable of masticating two hundred pounds and others not more than twenty or thirty at a time.

The whole of this outlay is caused by the manner in which the gum is treated, previous to its being sent over to this country, and which by a knowledge of the requirements of our manufacturers, and a little outlay in teaching the natives, or better still, founding establishments of our own, might readily be done away with. The gum, as we named in our first paper, comes from the tree in a milky juice, and if placed in air-tight vessels with a little spirit, may be brought over in that condition. In this pure state it readily, on exposure to the air, assumes the tenacious character of the bottle gum, and is equally valuable for all the uses of the masticated material.

Nature and Uses of Gums.

There is a very general misapprehension of the nature of those substances called *gums*, and as a consequence of this, the misapplication of the term is quite common. Various resins are frequently called gums, such as india-rubber called "gum-elastic," while it does not possess the main property of a true gum. In chemistry, there are classes of substances, such as gums and resins, which have certain distinctive properties different from others, and unless a person is acquainted with the nature of these substances, he is very liable to commit mistakes when he has occasion to speak of them. Some particular information on this subject will therefore be of general benefit. A pure gum is chiefly distinguishable by being soluble in water and not in alcohol; this is a test of its character which makes a distinction between it and resin. There are several species of gums, generally arranged into three varieties—gum-arabic and its analogues dissolve entirely in water, and their principal is called *arabin;* gum-tragacanth simply softens and swells in cold water, its principle is called *tragacanthin;* cherry gum only partially dissolves in water, its principal is called *cerasin.*

Gum-arabic is perhaps the oldest and best known gum. It is obtained from the Arabian acacia, and many persons suppose that the *shittah* tree mentioned in the Bible in connection with the building of the temple was the acacia. The gum of this tree exudes in a liquid state from the trunk and branches, and hardens by exposure to the air. The largest quantities are obtained from the trees in the hot and parching months of July and August; and the more sickly the tree the more gum it yields, and the hotter the weather the more prolific it is. It is stated that pearls are formed in oysters by the secretion of crystalline matter caused by wounds, hence these gems have been called "the tears of the oyster." Upon the same classic basis gum-arabic may be truly called "the tears of the acacia." Many persons suppose that this substance is found exclusively in Arabia, but this is not the case; it is also obtained in Egypt and various other parts of the Turkish empire. It occurs in globular pieces or tears; its color is generally a pale amber, and it is inodorous and brittle.

Gum-arabic dissolves in both hot and cold water. Leibeg holds this gum to be a hydrate of carbon, and expresses its composition by the formulæ C_{12}, 11HO. When boiled with very dilute sulphuric acid it is converted into grape sugar; borax coagulates it, and alcohol precipitates its *arabin* in a white mass from its solutions. It is much used in medicine as a demulcent; and usually forms a component part of cough lozenges. A small piece of it, if allowed to dissolve slowly in the mouth, tends to allay a troublesome cough by diminishing the irritation of the fauces as it sheathes the affected part from the atmosphere and dilutes the acid secretions. It is therefore a very excellent and mild substance to use by persons who have throat affections. It is also an excellent sustainer of life, as a food. The native Kaffirs sometimes live upon gum for many days during long journeys in the desert. Formerly gum-arabic was much used as a vehicle of colors in printing, but it has been superseded by dextrin.

Barbary-gum is obtained from Morocco, and is of a

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light greenish color, occurring in small irregular tears.

Gum-senegal is an African product, and is derived from several species of the acacia. It occurs in larger tears than gum-arabic, and these are chiefly of a light brown color. *East-India* gum is very similar to the gum-arabic, at least some specimens of it, and is probably the product of a kindred tree. South Africa also furnishes *Cape gum*, which is obtained from a species of acacia resembling that of the Arabian desert. It is of a pale yellow color, and generally held to be of a rather inferior quality. The Kaffirs make quite a business of collecting this gum for export to England. Gum-mezgnite, known as *musgnit*, is an American product, obtained from a tree which grows in the high and dry regions of Texas and New Mexico. It is a pontaneous semi-fluid exudation, concreting by exposure into tears, and sometimes rounded balls about the size of hazel nuts, semi-transparent and of an amber color. It contains 84.96 per cent of arabin, and is therefore an excellent gum, but it has not yet become an article of common merchandise. None of the nomadic tribes of the American deserts have yet made a business of gathering it in the warm season, as the Kaffirs do the gums in South Africa. The *musgnit* is a true gum, as it is not soluble in alcohol, but is so in water, with which it makes an excellent mucilage.

Cherrytree gum is obtained from the trunks of the plum, peach, apricot and cherrytree, and has the appearance of the poorer qualities of the gum-arabic. It is only partially soluble in water, and is divisible into *arabin* and *cerasin*. It is not employed for any useful purpose, so far as we know.

Gum-kino is a product of a dark red color, and is gathered from trees which grow in the East Indies, Australia and Africa. It contains tannic acid, and is a powerful astringent, capable of tanning the skins of animals. It is principally used in medicine for obstinate diarrhœa.

Gum-catechu is rather an extract than a gum. It is soluble in water, and is much used for tanning skins, and dyeing brown colors on cotton fabrics. It is an East Indian product, also called *terra-japonica* and cutch. There are several varieties of it; the best are of a dark brown color.

Gum-tragacanth or gum-dragon is a widely known and much used product. It comes from Asia Minor and Northern Persia, and is the natural exudation of the shrub *astragalus*. To secure it, the peasants clear away the earth from the root of the plant, in the months of July and August, and they then make incisions in the bark. The gum exudes the whole length of the cuts and soon becomes hard, when it is collected and put into bags. If the weather be warm and dry, the gum will be white and clear; but if damp, it assumes a brownish tinge. The finest specimens of this gum are generally shipped to France. Instead of dissolving in cold water like gum-arabic, it merely intumesces; but when it is subjected to ebullition in water for a considerable period of time, it gradually becomes like a solution of gum-arabic, and a portion of it nearly dissolves—hence some chemists suppose that it is transformed into *arabin*. The insoluble portion of gum-tragacanth contains considerable starch and lignin. This gum is occasionally employed in medicine, for the same purpose as gum-arabic. The inferior kinds of it are used as a mucilage by shoemakers to give a gloss to the heels of boots. It is also much employed in France for pasting artificial flowers, and imparting a beautiful gloss to the elegant colored prints which decorate the paper boxes in which ribbons, silks, and artificial flowers are packed. There are several other varieties of gums not particularly described; but the most important have been mentioned, with the exception of a mucilage, apparently of a true gummy character, which is obtained by steeping flax-seed in water. This mucilage is now employed for dressing some qualities of silks as a substitute for fine glue and pale gum, and it is a superior article for this purpose, especially for black silk. A wrinkled piece of black silk may be made to look as well as when it was new, by sponging it slightly on the right side with a weak mucilage of flax-seed, then ironing it with a hot flat iron on the wrong side. The table for ironing silk should be covered with several folds of fine cotton cloth, because a covering of coarse cloth will leave the print of the coarse threads upon silk. Artificial gums are now manufactured and used upon a large scale. In a future article we shall describe these and various processes for making them.

ROMANCE OF THE STEAM ENGINE.

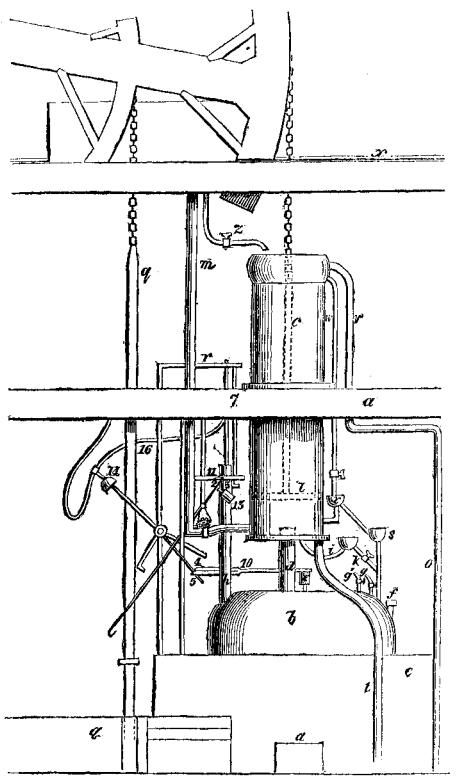
Article XI.

POTTER AND BEIGHTON.

In the last article, the first condensing pumping engine, having a piston in the steam cylinder and operating through a walking beam, was represented. The operation of it depended upon the care of those who attended it. This demanded the most unremitting observation and labor in opening and closing the steam and water cocks by hand. When the attendant opened the steam cock, he was obliged to watch the ascent of the piston, and when it had reached the proper hight, the cock was shut in an instant, and at the same moment the injection cock had to be opened. After the injection water had condensed the steam, the piston descended into the vacuum with an increasing velocity, which, if not arrested with inlet steam at the precise moment, some part of the machinery was sure to be broken in pieces. A regular series of simultaneous movements were required to operate the cocks, and an engine-man or cock-boy sat upon a seat where he had all the cocks at his command, by a set of catch-strings, which required his incessant attention.

The first person who successfully improved the devices for operating the valves was Humphrey Potter, respecting whom Desaguliers states that, having been employed, in 1713, to attend one of Newcomen's engines, in order to save himself the trouble of watching, contrived to make the engine work the levers of the valves by strings attached to the beam. In some accounts which we have read of Potter, it is stated that he was a boy not over fond of work, rather lazy in body, but we don't believe a word of this; we think he was a genuine mechanic, fruitful in expedients, and a true inventor.

The next person who made a decided advance in rendering the steam engine self-acting was H. Beighton, a mining engineer of Newcastle-upon-Tyne, who constructed a series of mechanical devices, consisting of levers, rocking arms, and toothed sectors all connected together, and by which the valves were opened



and closed by the walking-beam, through a vertical tappet rod connected to it. Beighton first operated his levers by hand, and they were called hand-gear; but he soon saw how the motions of the piston could do it better than an attendant, and he thus applied his devices as represented by the accompanying figure: *a* is the fire place, *b*, the boiler, *c*, piston, *d*, steam pipe, *e*, axis of the regulator, or steam valve, *d*, steam pipe, *f*, a loaded or safety valve, "which gives vent to the steam of the boiler in case it grows too strong; *g*, gage cocks with their pipes, one of which goes down so far into the boiler, as to be two or three inches above, and the other so far below the surface of the water therein," the water being of a due hight when the steam is emitted by the shorter, and water by the longest pipe; *h*, a pipe fixed to the head of the boiler, and called the *buoy* pipe, open at both ends, the lower end being a foot or more below the surface of the water in the boiler. Within this pipe is a cylindrical buoy that swims upon the water therein; and when the steam in the boiler is become so strong as, by its pressure, to force water up the said pipe, it then raises the buoy, whose axis causes the *balance*, *r*, and *inceptor*, 7, also to rise, and lifting the *notch*, 2 from 3, on one end of the lever, permits 13, a weight attached to it, to fall so far, till the *injecting-cock* at the axis of the said lever, is opened, by which an injection of cold water into the cylinder, and consequently a vacuum made by the condensation of the steam. The pressure of the atmosphere now brings down the inner end of the great lever, when one of the pins in the hanging rod, *q*, takes hold of 1, the end of lever, *o*, which, by the fall of weight 13, at the other end of it, was raised as above, somewhat higher than the parallel of its axis at *n*, and brings it down so far till the end, 3, is raised up as high, as to be again taken hold of by the notch, 2, at which time the injection-cock is thereby shut, and the regulator, *e*, is opened; *k*, a pipe for supplying boiler with hot water from top of cylinder; *l*, piston, having always eight inches of water lying upon it; there is a "circular plate in diameter nearly equal to the cylinder, and closed thereto, with leather round the edge;" *m*, injecting pipe having an injecting cock, "with its wheel, which is opened and shut by *o*, a small lever and its quarter wheel, whose ends 1 and 3 are alternately lifted up by the engine's motion;" "*p*, an axis moving between two standards, with its shanks, 4 5 6 8 9, and a slider 10—*q*, beam (or plug-frame)" hanging on the great lever, and moving up and down with it, opens and shuts the regulating and injecting cocks by three pins, set higher or lower as occasion requires it; one of which pins as the beam is going up, upon the access of the steam into it, takes hold of 8, attached to axis, *p*, and raises it to such hight, till the weight, 14, on lever 9, gets beyond the perpendicular of its axis, when by its own gravity it falls so far toward the cylinder as the piece of hard leather, 15, will permit it, by which motion the rod 5, the end of which appears in the figure at a pin in the slider, 10, is removed, and lever 4, is brought down to take its place, and striking against this pin, carries it away so far, and with it the slider till the regulator at *e*, to whose handle the slider is fixed, is by this means shut, and the steam confined in the boiler—by the same motion the lever, 6, shown slanting downward, is raised somewhat above the axis, and lies ready to be taken hold of by another pin in the hanging beam, *q*, which, upon the condensation of the steam, brings down this lever so far, till the weight, 14, is again brought beyond the perpendicular of the axis on the other side, when, by its own gravity, this again falls beyond the perpendicular of its axis on the other side; by that motion the lever, 4, is again removed from the pin in the slider, and the lever, 5, is made to strike against it, which opens the steam valve.

The steam now passes out of the boiler into the cylinder, and the pressure upon the surface of the water being abated, the *buoy* in the pipe, *h*, falls, and with it the balance, *r*, and inceptor, 7, and the notch, 2, takes hold of the end, 3, of the lever, *o*, by means of which the injecting cock remains shut, so that the steam by its force against the bottom of the piston countervails the pressure of the atmosphere, and permits it to rise along with the hanging-rod, *q*, which, by the action of the pin, shuts the regulator, when the steam being confined and the injecting cock shut, the engine remains in this position until the steam becomes strong enough by its pressure again to rise the *buoy* in the pipe, and a new stroke is begun. The outer end of the great beam works a pump; *r*, is a balance (or lever) one end of which turns up a pin, the other end is fastened to the higher end of the inceptor, 7, lower end fastened to the lever, 11; these, as have been described, rise and fall together by means of the buoy; *s* is a cup receiving overplus of water from *x*, and conveying it into boiler; *t*, a pipe conveying the injection water into cistern, having an immerged valve at the lower end; *v*, a pipe conveying waste water from the piston when it rises to the top of cylinder; *x*, a valve through which the air is forced by the steam; *z*, a cock supplying piston with water.

Such, it is stated, was the first self-acting steam engine; the movements of the valves were thus regulated accurately by the motions of the piston. This was a great step in the progress of the steam engine.

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AMERICAN ENGINEERS' ASSOCIATION.

[Reported for the Scientific American.]

On Wednesday evening, January 23d, the regular weekly meeting of this association was held at its room, No. 24 Cooper Institute, this city—Thomas B. Stillman, Esq., President; Benj. Garvey, Esq., Secretary.

The subjoined letter was received from Mr. R. V. DeWitt, of Albany:—

ALBANY, N. Y., Jan. 16, 1861.

Steamer *Simeon De Witt*, of Cayuga Lake:—Horizontal cylinder, 50 inches in diameter, 72 inches stroke; steam pipe, 12 inches in diameter; steam drum or chest, 12 inches in diameter; nozzles or passages, 5 by 15—75 inches; disk cut-off valve, 8 feet from drum, cutting off at one-third stroke (26 inches); pressure on piston before cutting off, 9 inches; revolutions, 19. An oil cup was inserted about 12 inches from the end of the cylinder. Upon one occasion the cock of this cup worked loose, so that the weight of its handle opened it, when the following occurred, to which attention is called:—

Upon the commencement of the stroke, the piston starting from the end to which the oil cup was fixed, air rushed in through the cup, showing a vacuum, until the piston passed the oil hole. When the piston had passed, a strong jet of steam blew out, continuing until the cut-off valve closed, when instantly air rushed inward, showing a vacuum, until the piston had progressed about one-half the balance of the stroke (24 to 28 inches), when the steam again blew out, until the stroke was finished. Afterwards, by repeating the operation purposely, I found the same result invariably.

Upon describing the above to an intelligent North river engineer, Mr. Spencer, of the steamers *Rochester* and *Henry Hudson*, he immediately remarked that this explained the cause of a singular accident that occurred to him on a steamer on Lake Erie, under his charge as engineer. Upon one occasion he had been obliged to shut his throttle valve instantaneously, when to his astonishment, the packing of the lower flange of the valve box (between the valve and cylinder) was sucked in and the engine disabled, the vessel being critically situated at the mercy of a gale until he had repacked the joint.

It would seem as if the particles of steam must cohere in such a way that the piston travels off before the mass can expand.

Queries.—Is the watery condition of the steam the cause, and will superheating (drying) the steam cure this evil? How far do these phenomena affect the cut-off question? How far does the density of the steam affect the result? Does the indicator show the result as above? Does not the fact stated indicate that, to use a cut-off to the best advantage, it should close gradually and not instantaneously?

I would like to have the following questions answered by some or all of the advocates or opponents of the expansion of steam, according to the consequence of their theories, because I can give the practical answer to it.

Datum.—A boat of fair model, 100 feet deck, 18 feet beam, drawing 3 feet 9 inches; cylinder, 48 inches; stroke, 24 inches; air pump, 22 inches; stroke, 16 inches; boiler capable of maintaining, say 15 lbs. steam per square inch at full stroke, ultimatum; natural draft. The cylinder is removed, and in place of it is substituted one of 30 inches, or 900 cylindric inches instead of 576. Stroke of piston unaltered, and the nozzles of the new cylinder being the same as that of the old, and fitted to the same valve box, flanges, &c. In fact, no alteration except diameter of cylnder.

Query.—With the same amount of fuel per hour, steam cut off on the new cylinder so as to keep the pressure at 15 lbs. in the boiler, will there be any gain or loss? if any, what per cent?

(Signed) R. V. DEWITT.

A short discussion ensued upon the questions propounded in the above letter, and the cause of the phenomena. It was then, upon motion of Mr. Merriam, referred to the Committee on Science and New Inventions.

The subject of expansion was called up by Mr. Louis Koch, who asked if the same boilers, or the same quantity of boiler capacity, was used at Erie in the experiments upon the expansion of steam, in cutting off at one-third as in following full stroke.

Mr. MERRIAM—Yes; in all the experiments alluded to at the last meeting this was the case.

Mr. KOCH—Well, then, the test was not a fair one for expansion, as you have to keep as large a quantity of water boiling for a small quantity of steam used, and that takes fuel.

Mr. MERRIAM.—Mr. Koch's argument is very good; but it seems the contrary was proved by one experiment of thirty-six hours, when the cut-off was tried with one boiler instead of two. It was found, however, that it took more coal and water, and this was accounted for upon the idea that the engine took her steam in a more moist state.

Mr. KOCH—I cannot think that possible.

Mr. GARVEY—I think it would be better to defer the discussion upon this subject until the experiments at Erie have been finished, and we have the full results thereof. I would, therefore, move that the whole subject be laid over until that period.

These remarks received the approbation of the meeting, and the motion was carried.

A letter was received from Mr. Enoch R. Iverson, of St. Louis, asking for a copy of this association's constitution and by-laws, for the purpose of organizing a similar society at that place.

Mr. GARVEY presented drawings of his improved Automatic Boiler Feeder. It was duly referred to the Committee on Science and New Inventions.

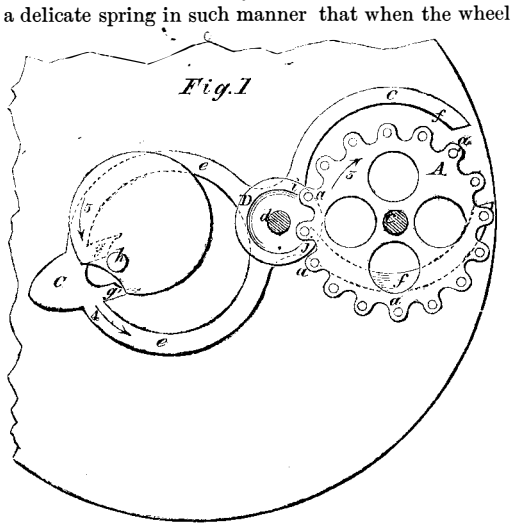
A committee was selected by the society to prepare a memorial to be presented to the Legislature, relative to the employment of practical engineers to inspect the boilers of this city. That committee consists of Messrs. Stillman, Roeder and Koch.

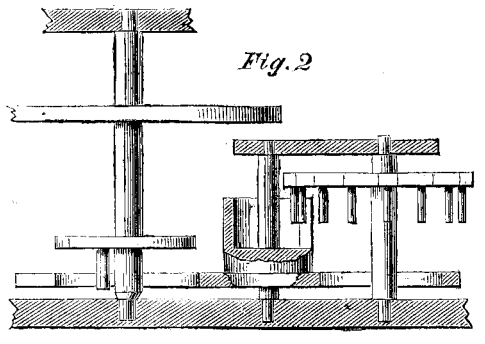
The association then adjourned.

Erratum.—In the report of this association, Jan. 9th, the instrument submitted by Dr. Van der Weyde should have been designated a "Pyrometer."

HUMBERT'S IMPROVED WATCH ESCAPEMENT.

The oscillations of a pendulum having been found to occupy always the same length of time, so long as the length of the pendulum remained constant, this instrument was applied to regulating the movements of clocks; and the attention of mechanicians was directed to the devising of some plan for applying the same principle to regulate the movements of portable watches. This led to the invention of the balance wheel. A wheel is nicely poised and connected with a delicate spring in such manner that when the wheel





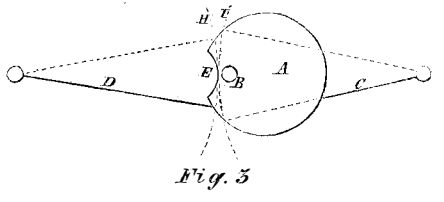


Fig. 3

is started with a rotary motion, the spring is coiled up with a constantly increasing strain which finally stops the rotary movement of the wheel, and draws it back in the opposite direction; thus giving to the wheel a swinging or oscillating motion, similar to the vibrations of a pendulum. It is found that the oscillations of the wheel, like those of the pendulum, are all performed in the same length of time, provided the size of the wheel and the tension of the spring remain constant. As the motions of the wheel would soon cease from friction, it is necessary to give it a slight push at each oscillation, and this is effected by the device called an escapement. Such an immense amount of thought has been bestowed upon this little piece of mechanism that it always surprises us when a new idea is presented in connection with it. And it would perhaps be impossible for us to have a more striking illustration of the absolutely inexhaustible field for improvement than the invention which we here illustrate; for it does present perfectly manifest advantages over escapements heretofore in use.

In the engraving similar letters indicate corresponding parts in all the figures. The escape wheel, A, is connected with the main spring by a train of gearing, so as to receive a motion in the direction indicated by the arrow, J. As this wheel revolves, it imparts through the lever, C, a pushing impulse, first in one direction and then in the other, to the balance wheel, B, Fig. 2. Below the balance wheel and upon the same axle is a smaller wheel which has the pin, *h*, projecting downward from its lower side and entering the space between the forks, *g* and *g'* that project inward from the hoop, *e e*, which forms a portion of the lever, C. Above the lever, C, and upon the same shaft, is a cylinder, D, which has a wide notch cut in its side, the two edges, *i* and *j*, of the notch being beveled for the action of the teeth, *a a*, of the escape wheel, A, thus serving as pallets. The forks, *f f*, of the lever C, are merely to balance the hoop, *e e*. It will be seen that as the wheel, A, turns forward in the direction indicated by the arrow, 3, one of the teeth, *a*, acting upon the pallet, *i*, causes the lever, C, to swing in the direction indicated by the arrows, 4 and 5, thus pressing the fork, *g*, against the pin, *h*, and pushing the balance wheel round in the corresponding direction; and as the balance wheel is drawn partly back by the balance spring, another pin, *a*, acts upon the pallet, *j*, impelling the lever, and with it the balance wheel in the opposite direction.

As each of the teeth, *a*, strikes against the cylinder, D, the motion of the scape wheel is stopped until the swinging of the lever brings the notch in cylinder, D, opposite to the tooth which is pressing against the cylinder, when the scape wheel is allowed to move forward the distance of one space between the teeth, *a a*, when it is stopped by the striking of the tooth against the opposite pallet. In this way the scape wheel is permitted to move the distance of only one space between its teeth at each oscillation of the balance wheel, and thus the movement of the watch is regulated.

In the escapement heretofore in use the forks, *g g'*, and pin, *h*, have been placed upon the side of the axle of the balance wheel nearest the fulcrum of the lever, while by this improvement they are placed upon the opposite side. A brief inspection of Fig. 3, by which the motions of the two are illustrated, will show that the change effects a considerable saving in the rubbing of the forks, *g g'*, against the pin, *h*; thus saving both friction and the use of oil, both of which it is very desirable to reduce to a minimum in the construction of watches.

The patent for this invention was granted through the Scientific American Patent Agency January 1, 1861, and further information in relation to it may be obtained by addressing the inventor, Prosper Humbert, Boston, Mass.

PHOTOGRAPHIC CARDS.—Card photographs in New York are now in the hight of fashion. In several of the leading galleries it makes the chief business, and in one so great is the demand that the actual work is at least a week behind the orders and the patrons make their applications and appointments a week in advance. Each photograph is multiplied by the dozen, so that it appears that photographs may soon become as common as newspapers, and we trust as useful. This card photographic fashion has also brought into commerce a neat photographic album, especially adapted to the cards, so that two or more may be displayed on one page, and hundreds in the whole book. This fashion is reasonable, and there is little doubt that it will become a permanent institution. We therefore advise our readers to be prepared for it, with suitable instruments and the albums.—*Journal of Photography.*

SENSIBLE ADVICE.—Professor Silliman, of New Haven, recently closed a Smithsonian lecture by giving the following sensible advice to young men:—"If, therefore, you wish for a clear mind and strong muscles, and quiet nerves, and long life, and power prolonged in old age, permit me to say, although I am not giving a temperance lecture, avoid all drinks above water and mild infusions of that fluid, shun tobacco, opium, and everything else that disturbs the normal state of the system; rely upon nutritious food, and mild, diluted drinks, of which water is the base, and you will need nothing beyond these things, except rest, and due moral regulations of all your powers, to give you long, happy and useful lives and a serene evening at the close.

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Our Correspondence.

WHAT IS MOMENTUM?

REPLY TO PROFESSOR SILLIMAN.

Messrs. Editors:—With your leave I will answer the communication of Professor Silliman, published on page 22 of the present volume of the Scientific American, in reply to a previous article of mine under the above caption.

The principal aim of Professor Silliman's communication is to give his idea of *momentum* in detail, and to show that my idea of it is incorrect, and advanced solely upon my own responsibility. The definition I gave, without a thought of novelty, was: "*Momentum* is a conventional term, used by physicists to express a certain product (MV), often occurring in mechanical analysis, but not susceptible of direct interpretation as a measure of any phenomenal action." From the first authority now examined, one not previously consulted, I quote: "*Quantity of motion.*—The products MV Mv, have received the name of *quantity of motion;* it is a conventional phrase, to which we attach no other signification than that of the product of a mass into the velocity imparted to or taken from it."—*Morin's Mechanics, Bennett's Translation, page* 65. I hardly think the authority of this eminent physicist will be called in question.

Let us now turn to the *amended* definitions, quoted by Professor Silliman from the *second* edition of his "Natural Philosophy."

First, "The momentum (MV) of a moving body is its amount of motion." As an explanatory term, what does "amount of motion" mean? Our only measure of motion is its rapidity or velocity. Does momentum measure the velocity with which a body moves? No; for one single element of the product measures that. Does momentum measure the velocity which a moving body is capable of imparting to a body at rest? No; for that varies with the mass of the body impinged. What "phenomenal action" does it measure? Can any one define "amount of motion" further than by saying it is the product of mass and velocity? To give B as a synonym for A, without being able further to define B, is no explanation whatever. Professor Silliman would say, I confound intensity with quantity. That I do not separate them in case of *motion* is true, nor do I see how they can be separated. When applied to such agencies as light, heat and electricity, it is easy to distingush between intensity and quantity. A battery may produce heat of sufficient intensity to dissipate a diamond, yet so devoid of quantity that it will not warm a room; while a furnace developes heat in such quantity as to warm a house, but possessed of so little intensity that it is powerless upon the diamond. The electricity, whose intensity enables it to dart from cloud to cloud, may not possess sufficient quantity to decompose a drop of water. As applied to these agencies, we distinguish between their intensity and quantity by the different classes of phenomena produced; but when we turn to a word not expressing an active agency, but a mere idea—motion—translation through space—susceptible of no other variations than in velocity and direction, what ideas of quantity or intensity can we attach to it?

Second, "Momentum represents the amount of force that is at any time accumulated and retained by the inertia of the moving body." Suppose a body, having acquired the velocity V, to be abandoned of all forces; according to Professor Silliman, its momentum then represents the accumulation of all the force that has acted upon it, or changed its velocity from o to V. If we regard all the force acting upon a body as accumulating in it, is it not evident that, in being brought to a state of rest, no body can give out a force greater than all the force accumulated in it? Hence, if this definition has any meaning at all, momentum measures the maximum force that can be developed by the impact of a moving body; but your correspondent would not himself claim this. The definition has no meaning. Force is not capable of accumulation. The instant it has acted it has gone forever; as force it can never act again. The ball which lies upon the table is just as much acted upon by gravity as when it falls through the air under its influence; there is just as much an accumulation of force in one case as in the other. Force, when resisted by no other force than the inertia of a body, produces motion and developes power; this power is stored up in inertia; this inertia, when the motion of the moving body is impeded, is capable of developing a new force, whose intensity varies with the rapidity with which the moving body is impeded; the intensity of this newly-developed force may far exceed the intensity of the force which originally produced the motion, but the work it does—the power it gives back—can never exceed that which the original force has stored up in inertia. The heat of the sun is a force; that force aids in the formation of every leaf that rustles in the breeze; every leaf when burned gives back heat; as well, then, might we say that the leaf measured condensed sunshine, as to regard momentum the measure of accumulated force.

Third, "Momentum is the measure of the force required, without regard to time, to set a body in motion with a velocity V." It is patent to all that *any* force, however small, acting upon any body however great, can, if you give it time enough, produce any velocity however rapid. This statement lies fairly within the terms of the definition, and reduces it to an absurdity. Professor Silliman would say that "without regard to time" is intended to convey a different idea from that which I have attached to it; but the attempt to give it any other meaning will make the third definition precisely the equivalent of the second.

Having reviewed the definitions given by your correspondent, permit me to point out one or two errors in his new illustration of the locomotive and train. The only resistance he takes into account is friction, which he speaks of as varying in *intensity* with the velocity, thus concluding: "Hence, to *impart* to the train a double velocity, a *fourfold* force is required." All modern physicists agree that the resisting *force* of friction is independent of velocity, while the *power* consumed per second varies directly as the velocity. The resisting *force* arising from impact of air and rough rails varies as the square of the velocity, while the *power* consumed per second varies as the cube of the velocity. The resistance arising from inertia varies inversely as the time occupied in effecting the change of velocity. Hence, to ascertain the "force required to impart a double velocity," we must take all these resistances into account, and all combined would seldom give a "fourfold force." When the velocities are comparatively small, but little additional *force* is required to *maintain* a double velocity; though, of course, the *power* consumed per second is somewhat more than doubled. Any force, slightly exceeding that required to *maintain* a double velocity, is capable of *imparting* such a velocity. Hence, instead of requiring a "*fourfold* force," as stated by Professor Silliman, we do not even require a *double* force. Not to let this assertion rest on my own authority, I refer to the experiments made and recorded by Pambour and Wood, on the traction of railway carriages, where the forces required to maintain the various velocities were determined as accurately as possible by means of dynamometers.

Permit me, before concluding, to substitute in the criticism of Professor Silliman's definition, contained in my first communication, the words "through equal portions of space" in place of "during equal portions of time."

Believing I have replied to all the points suggested by Professor Silliman's communication, I remain, yours respectfully, Jos. W. Sprague.

Rochester, N. Y., Jan. 12, 1861.

Kerosene and Coal Oils—Explosive Fluids.

Messrs. Editors:—The manufacture of kerosene and coal oils, to which may now be added the oils distilled from petroleum, have introduced new illuminating agents to the public. These oils may be considered equal to coal gas in illuminating power and cheapness, but they are not so cleanly nor convenient. Their consumption has now increased to a degree which calls for care on the part of the consumer and honest skill from the manufacturer. Perhaps the time is not far distant when an authorized inspection will have to be made of the liquids sold for affording light, with reference to the safety of their use.

Alcoholic camphene and such inflammable hydrocarbons have long been in use; necessity has compelled their employment for giving light, despite all the dangers attending their consumption. Coal and petroleum oils are free from these dangers, provided they are properly manufactured and brought to proper proofs or densities. Some of the oils or spirits obtained from coals and petroleum are as unsafe in lamps as alcoholic camphene, on account of their low density and volatility. Those oils are generally colorless in the distillation until they reach a density of .800, or proof 44°. At this proof they are unsafe to burn in lamps. At a temperature of 75° Fah. they will inflame on the approach of a lighted taper.

The struggle between the distillers of coal oil and petroleum oils has begun to run so high that their chief object seems to be the production of colorless oils, although the yield is less and the risk in burning is greatly increased. Oils have been sold at proof 45°. These liquid hydro-carbons may be tested by applying a lighted taper to a small quantity of the oil, contained in a watch glass. If the oil takes fire when its temperature is 65° or 70°, it will be liable to explode in burning in a lamp, a circumstance which has happened several times already, and serious consequences have been the result. The above oils are also sometimes mixed either with camphene or with fusil oil. The former renders them more inflammable; the latter is a product obtained in the manufacture of alcohol. It is known by its suffocating odor, and both the oil and its vapor are poisonous; therefore they should be carefully avoided.

The proper proof of oils obtained from coal, petroleum, bitumen, &c., and intended for lamps, is 40°, and not exceeding 41°, or specific gravity .819. At this density they will not inflame at the surface when their temperature is 60°, and they may be stirred with a lighted match, provided always that the benzole or eupion has been removed from them. Samples have been submitted to examination composed of light naphtha or benzole mixed with heavy oil. These oils also are unfit for lamps, for, besides being open to the objections before mentioned, they are liable to smoke after the lighter parts of the mixture have been consumed.

In the purification of these various hydro-carbon oils, very different methods are practiced by persons who profess to be experts in the business; hence the great diversity in the character of the oils offered in the market. From the fact that the stores and the streets adjacent to the places where these oils are stored, are readily distinguished from all others by a foul odor, it is quite evident that the art of purifying these oils is not yet perfect. With due regard to color, odor, &c., it will be to the interest of the manufacturers to produce an article which will be safe to burn, and which will avoid the dangers so justly chargeable to explosive burning fluids. Where any doubt exists regarding the quality of an oil, it should be submitted to a careful test, rather than risk the reputation of an excellent illuminator and hazard the lives of consumers.

G.

Cheap Boilers for Sugar.

Messrs. Editors:—Those who live where lumber is cheaper than iron can make a boiler in the following manner:—First get some plank about two inches thick and as wide as you wish the boiler to be deep; put these together in the form of a box without top or bottom, use large nails, or screw bolts reaching from side to side. Next joint off one edge and lay on a sheet of iron large enough to cover it, and then snap a chalk line on the iron where the rows of nails are to come. Now take a punch which is a little smaller than the nails and begin at one end; punch a few holes about half an inch apart and nail on the iron for a bottom, putting in two rows of fourpenny nails. Set this box on your brick or stone work, and build your fire under it. I think maple plank is the best for this purpose, as pine gives sugar a pitchy taste. C. B.

Printing Maps in Colors.

Messrs. Editors:—Is not some improvement in the mechanical execution of our maps necessary? It is impossible to trace on any map of the United States of ordinary size the water courses of the country. The most conspicuous objects on most of them are great black lines, which, on the usual scale of our maps, are one to three miles wide, representing our railroads. Would it not be an improvement to print maps in colors? Is not this practicable? Why not represent railroads in red lines, rivers and small streams in green, common roads in yellow, and canals in blue? All the colors clear, through which names of places, &c., might be easily read. Maps printed in colors would have an attractive appearance, and outsell all others.

S. H. S.

Fort Laramie, N. T., Jan. 29, 1861.

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Economical Manure.

Messrs. Editors:—I beg to ask your opinion on the inclosed recipe for manure which I have copied from a "farming journal." I wish to know whether you think it good or not, or if you can improve upon it in any way. Some of the ingredients, I am informed by a druggist here, I could not obtain except at an extravagant price, not being manufactured on a large scale, or, at least, only for medical purposes. Can you kindly give me any assistance or information on the subject through the Scientific American?

The following is the recipe alluded to:—

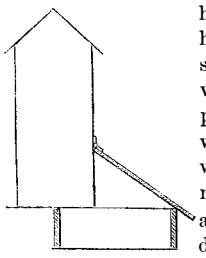
Dry peat	3 bushels.	Nitrate of soda	40lbs.
Wood ashes	3 "	Sulph. ammonia	33 "
Bone dust	3 "	Sulph. soda	50 "
Calc. plaster	3 "		

The last three are those that there is a difficulty in procuring on a large scale, at least except in too refined and expensive a state for my purposes (as I am informed). Can you tell me if this is correct or not, and to whom I should apply for the articles?

J. F. De N.

Camden, S. C., Feb. 4, 1861.

[There is no subject of greater importance than the economical production of manure. On this depends the question whether nations shall increase their production of food, and consequently their population and power, or whether they shall run into barrenness and decay. One of the expensive salts in the above recipe and the elements of both the others are found in urine. Almost any man who has a supply of peat can procure great quantities of manure by simply saving that which is now wasted. All that is necessary is to place the peat so that it may catch and absorb the urine from the household and from all the animals about the establishment. It is better that the peat should be placed under cover, and the best plan that we have ever seen is to make a shallow vault of cement, and set the privy over the edge of it, thus—



having the cover of the vault hung on hinges at the top, and sloping to shed off the rain. We venture to say that 20 bushels of peat, left in such a vault three weeks, at an ordinary farmhouse, would make richer and better manure than if mixed with the above-named expensive ingredients.

If peat is not to be had, loam forms a good substitute. With either, it is well to throw in bones, leached ashes, charcoal dust, leaves, and, in short, any waste animal or vegetable matter upon the premises.—Eds.

Gang and Steam Plows---Improvement Wanted.

Messrs. Editors:—I have written to all the patentees of gang plows in the hope of getting one, and have failed to get a reply. We have reapers, seed drills and corn planters, but our fall plowing is always behind; consequently, farmers are not ready in the spring to get in an early crop. I believe that if *you* would call the attention of inventors to this want of Western farmers, it would be supplied.

S. C. C.

Bush Creek, Iowa, Feb. 12, 1861.

[Any manufacturer of plows can make a gang and combine them together so as to plow five or six furrows at once; but it must not be forgotten that for every extra plow there must be an extra team added, and the simple question in relation to such plows, is whether it is better to use, say four separate plows and four separate teams, or four plows combined in one, drawn by as many united teams? The economy of the operation would perhaps be on the side of the gang plow, as it could be managed by one-half the number of persons required for the separate plows. We refer only to plowing on land free from large stones, roots, &c., as single small plows are the most convenient for rough farms. The letter of our correspondent, coming as it does from the Great West, brings up the question of steam plows again. These are the very agencies which farmers on the prairies, who have large tracts to cultivate every season, require. They want a plow that can turn over a hundred acres in a few days, so that they may be able to get in all their crops in good season during their short spring weather. A light, strong and simple steam plow is what they need, and the engine should be adapted for other work when not used in plowing—such as threshing, sawing wood, grinding, &c. There is still room for improvement in this department of agricultural mechanism.—Eds.

Exterminating the Black Weevil.

The black weevil is an insect which attacks and destroys wheat in granaries. Most persons apply the name of weevil to the wheat-midge which attacks the grain in the field, but this is a mistake. The weevil may get among a bin of wheat and destroy the most of it before their ravages are noticed, because they penetrate through the hull of the grain by very minute holes and eat out the whole interior of the kernels, leaving the outside as perfect in appearance as it had been before. Their ravages are carried on without cessation, so that, when they get among a bin of stored wheat, they usually destroy a large quantity of it. Any sure and safe plan for destroying them, or for preventing their attacks, would be of great benefit. in a late number of the *Country Gentleman*, a correspondent gives the following experience respecting these insects:—"I built a granary, I think in August, 1857, and made some strong salt brine, with which I wet the sides and bottom of the granary, and sprinkled some among the wheat. And never, to my recollection, have I seen a black weevil in my granary. I think it an excellent plan for farmers to salt their wheat in the straw as they haul it to stack or barn, so the salt would strike through the wheat and straw, and cattle would eat the straw more readily."

A Discovery that will Put an End to all War.—Chloride of nitrogen will, it is said, soon be utilized as an implement of war. Its employment would be likely, we should conjecture, to put an end to all war. Mr. Isham Baggs, of England, in announcing his discovery, makes mention of a system of ballooning advocated by Mr. James. Mr. Baggs proposes to carry his composition in balloons, and drop it from the air in the midst of armies and fortresses. "The very mention of this compound," he goes on to say, "as a proposed element in modern warfare, may possibly provoke a smile among chemists, who know that the most accomplished among their number would scarcely dare to experiment with it in quantities larger than a grain of mustard seed, and, even then, only at a respectful distance, and under guard at the moment of detonation. And yet not one of these chemists will be bold enough to deny that, with two or three chemically clean carboys of this terrible compound present in a city or fortress, however strong, the slightest cuttings of phosphorus, or a single drop of olive oil, coming in contact with it, would in one instant decide the fate of the place and its inhabitants." Mr. Baggs then proceeds to affirm that he "can manufacture this deadly material with perfect safety, and in any required quantity, and that it may be safely conveyed to its destination by James' system of balloons."

Rifled Guns and Shells.—An Armstrong gun—a 100-pounder—was lately tried at Shoeburyness, England, at 1,000 yards distance (a little over half a mile) against an old ship for a target. Pieces of paper 12 inches square were set up for special marks, and were struck every shot. The experiments were made with shooting percussion shells, each of which exploded whenever it struck, and made a hole in the side of the ship about the size of an ordinary house door. This old ship was partially plated with iron, for the purpose of testing the power of the shells. One plate was struck on the edge and split completely through, and the vessel was at last set on fire with shells filled with molten iron.

Telegraphic weather reports are daily sent to the Smithsonian Institute at Washington from almost all parts of the Union; and the state of the weather being indicated on a large map in the public hall, by cards of different colors, the spectator can observe where storms are occuring, and trace their progress usually toward the East. Thus, from the Cincinnati and St. Louis reports, the state of the weather at Washington may be foretold twelve hours in advance.

The Wealth of Ohio.—By the census of 1860, the population of Ohio is 2,346,000. The Commissioner of Statistics gives the total wealth of the State $888,302,601. This shows that the people of Ohio are worth in the average, including men, women and children, $379 each

Column of Varieties.

The weight of the iron-cased frigate *Warrior*, when ready for sea, will be 8,827 tuns; the weight of the hull alone will be no less than 5,700 tuns.

In a circular recently published by Messrs. Dufour & Co., of Lyons, France, it is stated that America takes 200,000,000 francs worth of silk from Europe annually.

There are no less than £350,000,000 sterling invested in the British railways of the United Kingdom. Their united receipts last year amounted to nearly £30,000,000 (about $110,000,000).

Aniline has recently been discovered in the coloring matter of certain mushrooms of the genus *boletus*. This coloring matter is of a deep indigo purple color.

The oil which is obtained from the natural wells in Pennsylvania, is now called "carbon oil," in contradistinction to "kerosene" and "coal oil," which are obtained from the distillation of coal and shales in retorts.

The greatest part of the crude well oil is sent from Western Pennsylvania to Erie to be shipped East for refining in the vicinity of New York. The yield is continually on the increase; during the year 1860, 21,794 bbls. passed over the Sunbury and Erie Railroad.

At a late meeting of the Institution of Civil Engineers in England, a paper was read by W. H. Preece, C. E., on submarine cables in shallow waters, in which he stated that, with a differential galvanometer, he could tell the exact spot of a leak or fault in a submarine cable sixty miles distant.

There are annually brought to New York 200,000 cords of pine wood, of which 50,000 cords are used for kindling household fires. The pine forests of Virginia supply the most of this material; but these are beginning to fail in supplying the demand, and new sources will soon require to be opened up—probably in North Carolina.

H. G. Bulkley, of Kalamazoo, Mich., has made the discovery that, by slightly steaming Chinese sugar cane before it is pressed, all the juice can be easily extracted with a common set of pressure rollers. As the pressing of this cane constituted the chief difficulty with farmers in obtaining sirup from it, this discovery is of great importance to them.

Another great cannon was lately cast at Pittsburgh, Pa., and called the "Union." It is of a 12-inch bore; the metal used in the casting amounted to 78,104 lbs., and it is expected to carry a ball a distance of 6 miles. This gun was cast hollow, not solid, as by the old process.

In tempering steel for what is called a "straw color," raise it to a red heat, then plunge it into oil having a temperature of 175°; for a purple color, plunge it into oil heated to 200°; and for a blue shade, the oil should be 212° Fah. This method of tempering with warm oil answers well for steel wire in coil, costly taps and dies, and cutters for gear engines.

A singular wager was won recently by a skater on the Lake of Geronsart, near Namur, Belgium. He bet that he would skate for an hour, carrying a basket of eggs on his head, without breaking one of them. He accomplished the feat in first rate style, having during the hour written his name in elaborate characters on the ice, beside tracing an immense variety of complicated figures, and at last set down the basket and received his wager, amid the cheers of all present.

Stereoscopic pictures combined with the "motoscope" are now exhibited in New York, representing persons in motion. The pictures are mounted in the ordinary way, and viewed in a stereoscope which differs from the common instrument only in having a metal screen worked by a spring which alternately passes before the lenses.

An amalgam of chemically pure copper with mercury possesses the property of serving as a solder for metals, and as a cement for glass and porcelain, to which it adheres strongly. At the expiration of ten or twelve hours it becomes sufficiently hard to take a polish, like brass or silver.

The export of grain from the United States to Europe during the past year has been unequaled. In the year 1859, 2,590,937 bushels of grain were exported to Great Britain; in 1860, there were 23,820,820 bushels exported, being an increase of 21,590,927 bushels. Never before has the surplus product of the United States risen to such gigantic proportions.

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Improved Governor.

As machines are made to run at some given rate of speed, it is important that they should run as required in order to avoid unnecessary wear and tear and waste of stock, and also to accomplish the most work in a given time. These and many other advantages, such as the avoiding of accidents and consequent delays, the quality of work done and fuel saved, appeal strongly to practical business men to examine all modifications in the governor, and to adopt the best which is to be had. The most novel feature of the governor here illustrated is that of its being able of itself to shut off all the steam and stop the engine in case of any accident, such as the breaking of the crank or shaft, disconnecting of piston or connecting rod from crosshead or crank pin, or the parting or slipping off the belt that drives the governor. Many and serious accidents have occurred from these causes, and are constantly liable to occur, notwithstanding the utmost watchfulness on the part of the engineer to prevent it.

In the sectional view, Fig. 2, the governor balls are represented at their lowest extreme, and the safety valve covering the steam port. By reversing the lever, A, as seen in Fig. 1, the balls are raised to the intermediate point of their range, which brings the valve port opposite the port in the valve cylinder, the governor being at rest in the middle of its entire range of motion and at the commencement of its governing range.

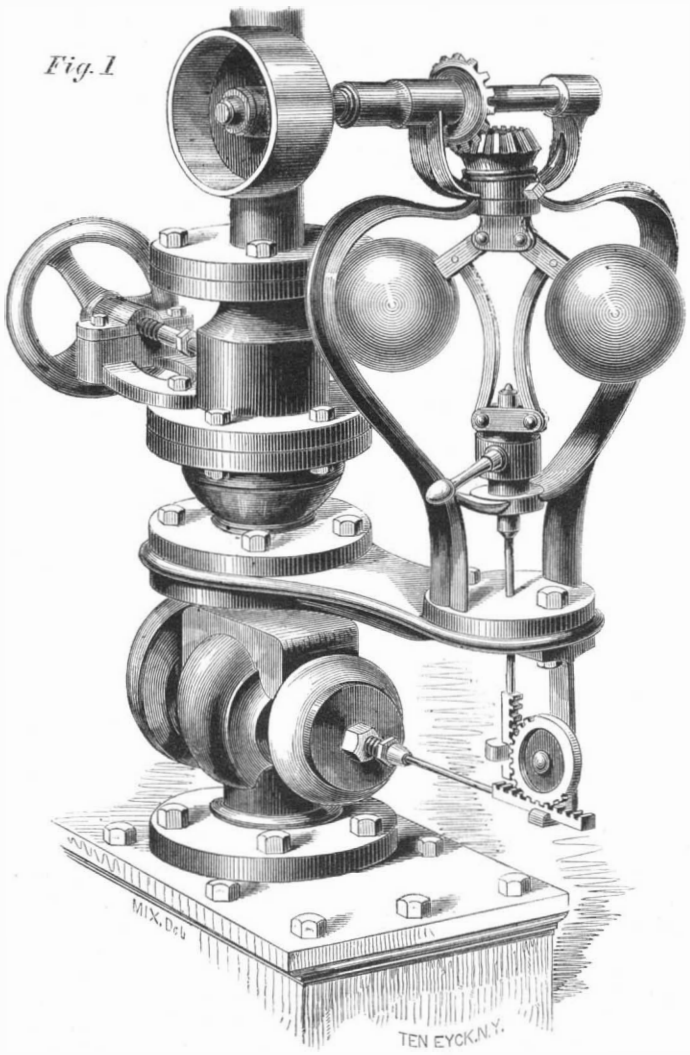
The lever, A, is attached to collar, B, inside of which is a spiral groove moving on a pin in stationary hub, C, which forms a part of bar, D D, and through the center of which revolves the tabular T-shaft, E. The rod, F, is secured to the shaft, E, by collars, H H. At the lower end of rod, F, is attached the rack, I, to the pinion, J, and rack, K, to the valve rod, L, to which is attached the governor valve, M, and safety valve, N, connected by bars, O O O. The arrows indicate the course of the steam, which enters the valve at boiler pressure. This entire arrangement seems peculiarly adapted to secure the end for which the governor is intended, viz., uniform motion of the engine with the least expenditure of power and waste of steam.

The inventor says:—"This invention has been thoroughly tested by responsible parties in this city for more than a year past, and its advantages are seen to be in its extraordinary quick and positive action equalizing the movement of the crank, producing an easy and elastic motion of the engine, by increasing and lessening the supply of power as the crank gains or loses its leverage, to produce which the heavy balance wheel is only an approximation. This results in a saving of much wear and tear of the engine and the machinery it drives, as also a saving of the employés who tend the machines and the waste of material used, beside the ability to do better work."

This the proprietors guarantee, and consequently apply the governors free of charge, and await the result of a sufficient trial.

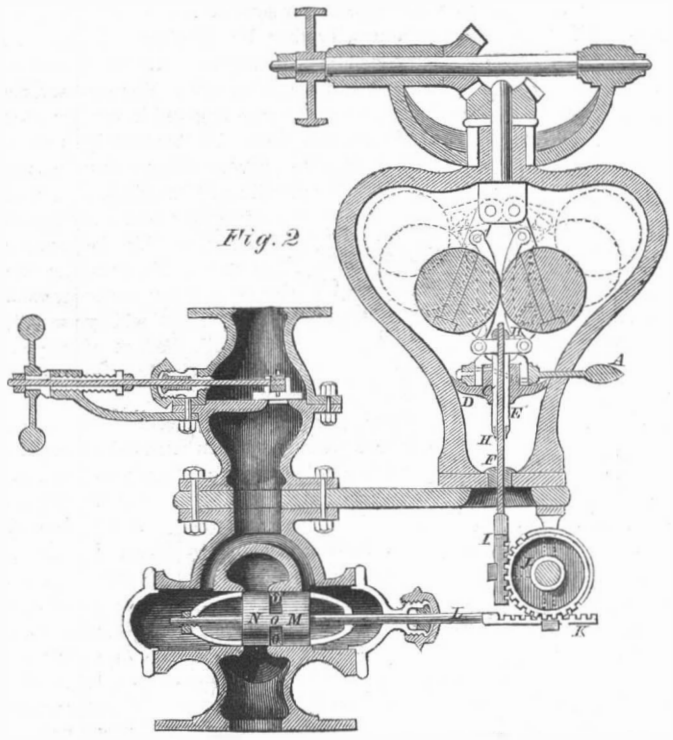
The patent for this invention was granted Oct. 11, 1859, and further information in relation to it may be obtained by addressing G. W. Lascell & Co., at Bennington, Vt.

Fig. 1



SNOW'S IMPROVED GOVERNOR.

Fig. 2



Progress of Agricultural Machines in England.

The London *Journal of Gas Lighting and Sanitary Improvement* states that the number and importance of the display of agricultural implements at the late Smithfield Club Show affords a striking example of the progress of mechanical skill and enterprise in that department. Sixty years ago, when the Smithfield Club had been founded two years, the implement show consisted of a few chaff cutters and a few contrivances for feeding stock. At present, it appears that a revenue of something like £1,000 a year is derived from the rent paid by implement makers for the four days of the show on about 20,000 square feet. This rent proves that an enormous business must be done every Christmas in steam engines, plows, harrows, drills, threshing machines, and other mechanical aids to farming, constructed in the best manner in factories devoted to the purpose. Twenty years ago, the village blacksmith and wheelwright supplied the mechanical wants of the surrounding farmers. Our London cotemporary goes on to say :—

The December meeting of the Royal Agricultural Society also proved that pressure had forced reform even on that most respectable, dignified, wealthy and torpid body—the Council. For the first time, practical men have been admitted into the committees that settle practical subjects. Two agricultural engineers and two or three real farmers have been added to the *dilettanti* committee of peers and squires who have hitherto settled the prizes and trials of implements and machinery. It was high time, for the result of the competitive trials of the last eight years has been to bring the council into well merited contempt. The prize list just issued classes the different implements in a more rational manner than heretofore, and affords as fair a means of trying them as possible, considering that for some the season is quite unsuitable, and for all the time allotted quite insufficient for arriving at any definite opinions as to their respective merits.

A very useful change has been made in the class for reaping machines. These machines were introduced from America at the Great Exhibition of 1851, and were, perhaps, the most useful mechanical result of that display. Ever since, three different principles have been brought into competition at the meetings of the Royal Agricultural Society. All have received prizes, and it is impossible to gather, from the decisions or reports of the judges, what are the respective merits of the three. Bell's, the Scotch machine, *pushed* by two horses, is self-delivering, requiring no manual assistance. Burgess & Keys', *drawn* by two horses, is also self-delivering. Dray's, drawn by two horses, requires a man to sit on the machine and help the delivery with a fork, while a gang must follow to gather up and bind the sheaves before the machine comes round again. A fourth—Cuthbert's—drawn by one horse, without self-delivery, was tried last summer for the first time at Canterbury, and carried off the prize from Burgess & Keys' self-delivering two-horse machine. One judge looked to economy in price and light draft of a non-delivering machine; another valued the saving of men's labor, even at the cost of horse labor; a third dwelt on the word "reaper," and did not value the superiority that could cut and leave oats, as well as wheat, ready for the next day's work. Bell's machine, tried on a flat, did its work well and won a prize, but failed utterly when required to cut on a moderate ascent. None of these points are to be learned from the reports of the judges or stewards. Equally absurd or obscure were the conditions under which threshing machines and steam engines were tried. In the prize list for the meeting at Leeds in July, 1861, among other reforms, reaping machine trials are divided into:—First, for cutting with self-delivery; second, cutting without self-delivery; third, combined reaping and grass mowing. The prizes for drills and horse hoes are arranged with like discrimination. So much for the introduction into the committee of men who really understand the matters they have to deal with. The motto of the Royal Agricultural Society is "Practice with Science."

THE Rev. Dr. Porter, of Chelsea, Tenn., has constructed an apparatus for making the gas which lights his church from cotton seed and rosin mixed together. Cotton seed oil should make a very rich gas, and in some sections of the cotton-growing States it may be economially applied for this purpose. We believe that this oil produces more olifiant gas, than is contained in coal gas used for illumination.

EXPLORERS IN AFRICA AND EGYPT.—At least fourteen different expeditions, of single travelers or more than one, are now exploring the interior of Africa from many points. Kriel has been sent into Asiatic Turkey by the Vienna Academy, and Rey is exploring portions of Syria and Palestine.

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VOL. IV. NO. 8.....[NEW SERIES.]....*Seventeenth Year.*

NEW YORK, SATURDAY, FEBRUARY 25, 1861.

ALTERING OUR NAVAL VESSELS.

It seems that Stevens' unfinished floating battery, at Hoboken, about which so many newspaper paragraphs have been published, has been the means of effecting a great revolution in the principal navies of the world. The London *Quarterly Review* says that the experiments made by Mr. Stevens at the expense of the United States government, in 1845, first demonstrated that wrought iron plates six inches thick form a perfect shield against the force of cannon balls; that Mr. Stevens communicated this fact freely to the engineers of England and France during his visit to Europe; that this knowledge led to the construction of the iron-plated floating batteries, the manifest usefulness of which, during the Crimean war, prompted the Emperor Louis Napoleon to build the fleet of iron-plated vessels which is now in process of construction in France. It is well known that this movement of France is being followed both by England and Russia, and thus the three leading naval powers of the world are providing themselves with fleets of iron-plated ships.

But our own government, having furnished the knowledge which has led to this great revolution in the construction of naval vessels, is plodding along, some ten years behind the times, and is just about to expend more than three millions of dollars in changing our old sailing ships into steam propellers. It is to be presumed that the Commissioners who examined this question ascertained all the facts bearing upon the subject which were known at the time of making their report, but at that time the brilliant success of *La Gloire*, the pioneer of the new French fleet, had not been demonstrated, and the extensive experiments now being made in England and France are developing knowlege of the subject so rapidly that it may be well for Congress to reconsider the matter before proceeding further with the contemplated change in our navy.

In the first place, it is pretty well settled that iron ships are better than wooden ones for the ordinary sailing rig; and they unquestionably possess peculiar advantages if they are to be driven by screw propellers. It is almost impossible to make a wooden ship with a fine run, such as a propeller requires, which shall, at the same time, be strong enough to bear the strain exerted by the screw. If we are to have even unplated screw ships, had we not better construct new ones of iron?

But a whole fleet of unplated vessels are completely at the mercy of one of the new iron-plated ships. A very few of the terribly destructive shells now in use will destroy any vessel that has no protection against them. By means of rifled cannon elongated shells can be thrown which will explode at the instant of contact, and one of these, bursting in the side of a ship, makes a hole as big as a door. Some of these missiles are filled with a burning fluid which is set on fire and scattered in every direction by the explosion. But perhaps the most destructive of all implements of warfare is the "carcass," which is a shell filled with molten iron. On striking a ship, the red-hot liquid runs down between the timbers, setting the ship on fire so extensively as almost to preclude the possibility of putting it out.

The statement may be startling, but it is made by high naval authority and is entirely credible, that a ship of war provided with these shells and with suitable guns for firing them would, in one minute, effect the destruction of any wooden vessel afloat. Two hostile wooden ships thus armed, meeting upon the ocean would inevitably burn each other up.

It is proved by numerous experiments that a plate of iron one inch in thickness is a perfect protection against these shells, but as a few discharges of solid shot will break such a plate to pieces with great damage to the ship and crew, it is of no value in actual warfare, and the only means of enabling a ship to sustain a combined fire of shells and solid shot is to cover her with plates of wrought iron 4½ inches thick, which are proof against both.

The experiments in England have shown that if wooden vessels, covered with thick iron plates, are exposed to a rapid fire of solid shot at short range, the framing of the ship is terribly shattered, even when the plates are not broken through. The only suitable vessels to receive the coating of plates are those which are built of iron. The engineers of France, as well as those of England, agree in this conclusion, and the French fleet would have been built of iron had there been time to accomplish this; but as the Emperor wanted the vessels finished by this Spring, it was necessary to use the materials on hand and to employ the mechanics who were trained only to working in wood. But the three great naval powers of the world are now busily constructing vessels of iron to be driven by screw propellers and to be covered with wrought iron plates 4½ inches thick.

The sailors in the United States navy are paid $18 per month, much more highly than those of any other nation, and they are consequently at least equal, if not superior, to any in the world. Still, to send these men in unprotected wooden vessels against the iron-cased ships of the European navies, would be simply to send them to a hopeless contest and certain destruction.

Instead of expending some millions of dollars on the old sailing vessels of our navy, would it not be better to put these all up at auction and let them be sold for freighting purposes, and then build our new propellers of iron and cover them with shot-proof iron plates?

ANOTHER GREAT MECHANIC GONE.

Recent news from Europe inform us of the decease of Sir Peter Fairbairn, at Leeds, England, on the 4th of last month. This eminent mechanic who was raised to the order of knighthood by Queen Victoria, was the son of poor but respectable Scottish parents, who apprenticed him at the age of fifteen years to the trade of a millwright, at Newcastle-on-Tyne. When his term had expired, he, at twenty-one, went to Manchester, and worked as a journeyman for several months with his elder and more famous brother, Mr. William Fairbairn, who still survives him. He subsequently went to London, where he worked several months. He next crossed over to France, where he was engaged in several establishments for about a year. All this variety of experience was sought for the purpose of improving his mind, increasing his skill, extending his knowledge, and making him a more perfect millwright and engineer. When he returned to England in 1823, he again entered his brother's establishment in Manchester, and worked for about a year, when his superior ability and character having become more widely known, he was offered a partnership with the firm of Messrs. Houldsworth, of Glasgow, Scotland, who were engaged as manufacturers of machinery. This proposition he accepted, and in this connection he continued for about five years, and then removed to Leeds, where he commenced business for himself independently. From a moderately small beginning he gradually arose to be one of the most famous, wealthy and extensive manufacturers of machines in the world, and at the time of his death about 1,400 hands were employed in his establishment.

Sir Peter Fairbairn was an ingenious inventor as well as a skillful practical machinist, and took out several patents for improvements in spinning machinery. His establishment was distinguished for turning out flax machinery of the first class, some of which we have examined, and we can say that it afforded good proof that his reputation was deservedly acquired. Of recent years he engaged extensively in making engineering tools of almost every description, and a large number of the machines that are employed in the British government arsenals for rifling and fitting the several parts of small arms and Armstrong guns were made at his works.

At the time of his death Sir Peter Fairbairn was 62 years of age, forty-seven of which had been spent in the most active manner, and sometimes under very discouraging circumstances. His life affords a most useful lesson to all young mechanics. With but an ordinary school education he arose from the position of an humble mechanic, under the sway of a monarchical government, to be one of the titled but never one of the exclusive British classes. It is related of him that during his spare hours, both when he was an apprentice and a journeymen, he availed himself of every opportunity to store his mind with useful information in all that related to his own profession particularly, and also with general knowledge to fit him for mingling with the most cultivated and refined society. He had the reputation of being a generous employer, and of having a straightforward business way with him which imparted confidence to all those with whom he had business transactions. He was buried on the 9th of January, and in Leeds his funeral was made a public event. A vast multitude of all classes followed his remains to the grave, and many persons from all parts of England assembled as mourners. The hearse was preceded by 700 mechanics—Sir Peter's workmen—and the procession was more than a mile in length. It is pleasing to reflect that this great mechanic was also a good man, and highly esteemed by all who had the pleasure of his acquaintance.

WHAT INVENTORS HAVE DONE.

While we were sitting, a few days since, in the counting room of one of our importers, a tall, intellectual, nervous and rather poor-looking gentleman came in, spoke familiarly to the merchant, and began to expatiate on what was evidently his hobby—the mistake of all the world in regard to the crank motion and the expansion of steam. We soon saw that his ideas were vague, and that he was one of those unfortunate individuals who, from presumptous self-delusion, waste their lives in endeavoring to overthrow the laws of nature, and who form so strong a contrast with the long line of successful inventors represented by Archimedes, Gallileo, Watt, Arkwright, Whitney, Morse, Goodyear, Howe, McCormick, &c., who, by patient study, learn the real truths of Nature's laws, and thus derive the power to compel her great forces to the service of man. When this visionary went out, the merchant remarked to us, "He is a cousin of mine," and added, with a sneer, "He is an *inventor*."

From the merchant's office, we went to one of the European steamers, and, as we came in view of her noble and graceful proportions, our mind flashed back to the time when the first canoe was invented, and glancing swiftly over the great improvements in navigation through triremes and argosies to the *Adriatic* and the *Great Eastern*, the question arose: How many merchants would have been in possession of their great ships and luxurious dwellings had there never been any inventors? The first boat that was dug out of a hollow log was unquestionably a great invention in its day; and from that beginning, through a long chain of inventions, the art of navigation has grown up to its present condition. It is to a succession of inventors that the world is indebted for commerce, with all the wealth and all the blessings which it bestows.

And not for commerce alone. The man who first sharpened a stick to use in planting his corn commenced the long series of inventions of agricultural implements which have led to the production of Peeler's plow and McCormick's reaper. Had none of these implements been invented, the earth would still be tilled by the unaided fingers alone, and what would have been its population and riches?

All the thousand manufactures which contribute so much to the comfort, convenience and elevation of the human race owe their existence directly and entirely to inventors. And without any of the varied forms of wealth that are produced by the arts of agriculture, manufactures and commerce, neither literature, nor sculpture, nor painting, nor any of the other results of civilization, would have been possible; mankind would still have been in the lowest depths of savage degradation.

The progress of inventions is now moving forward more rapidly than ever before, and the SCIENTIFIC

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American claims to be performing, though indirectly, its share of the work. We are doing what we can to gather and disseminate a knowledge of what has already been accomplished, to guard inventors from the waste of time in the pursuit of discoveries already made, and to stimulate them in their beneficent work of carrying the human race onward to a still higher civilization.

THE PROPOSED NEW TARIFF.

The intense excitement of the public mind respecting the absorbing question of our national unity, has caused one of the most important measures ever introduced into Congress to receive very little public attention. This is a bill which contains provisions for a complete revolution of our present tariff system. It was introduced during the last session of Congress, passed the House, went to the Senate and was referred to the appropriate committee who reported it for action, with several amendments, on the first of this month.

The present tariff is based upon *ad valorem* duties; that is so much per cent according to the value of the goods. This is a varying tariff, for as the prices of the goods rise and fall, so does the tariff. Thus allowing a certain article, say woolen cloth, to be charged an *ad valorem* duty of 24 per cent, if the price per yard is one dollar, twenty-four cents of revenue will be paid for each yard; if the price falls to 90 cents per yard, the revenue derivable for one yard is 21·60 cents; if it rises to $1.20 per yard, the duty will be 28·60 cents on each yard.

The proposed new tariff is as complex as the present one is simple. It proposes specific duties on some species of goods, and *ad valorem* duties on others; and it also divides foreign products into a greater number of classes. For example, the present duty on foreign iron is uniform, and 24 per cent; the new bill, on the other hand, is prolific with diversification. The following are a few examples taken from it:—

Cast iron and wrought iron nuts, &c., pay	$25 ℔ tun.
Boiler iron and hoop iron	20 "
Bar iron	15 "
Railroad iron	12 "
Pig iron	6 "
Iron wire, certain sizes	$0.75 ℔ 100 lbs. and 15 p. c.
Do. do.	1.50 " 15 "
Do. do.	2.00 " 15 "
Anchors	1.50 "
Iron pipes	50 cts. ℔ 100 lbs.
Wrought iron for locomotives, &c.	5 cts. ℔ lb.
Sheet iron, smooth	2 "
Tubes, tacks, &c.	2 "
Iron castings, not specific	25 per cent ad val.
Chains of certain sizes	25 " "
Screws	30 " "

It will be observed that the above duty on wrought iron for locomotives is $12 per tun.

The bill also proposes great changes in the duties on worsted and woolen goods. The *ad valorem* duty on carpets is 24 per cent; the new bill places the duty on the square yard; thus, velvet carpets worth $1.25 per square yard are now to be charged 40 cents per yard; Brussels carpet 30 cents per square yard, and ingrain, 20 cents, &c. On woolen cloth the present duty is 24 per cent; the new bill proposes a duty of 12 cents on every pound weight of some cloths, and 20 per cent *ad valorem* duty additional—a compound tariff.

We have only given a few examples of the changes proposed by the new bill, for the purpose of rendering its nature clear.

Another important feature in this bill is the virtual abolition of the Bonded Warehouse system. By the present system, foreign goods may be imported and placed for three years in a government warehouse without paying duty; and they can at any moment be withdrawn and re-shipped abroad. Great quantities of goods are imported from Europe and kept in these warehouses until favorable opportunities occur for our merchants to ship them for trading purposes to Cuba, Brazil, China, Africa, &c. These warehouses have made all our seaports entrepots for foreign goods; they have been the means of affording a large carrying trade for our shipping. Any merchant can also import goods and place them in bond without paying duty until they are sold, or are about to be sold; or they may be sent back, if they are not saleable. The new bill proposes that goods shall only be allowed ninety days in warehouse without paying duty—a charge almost tantamount to a destruction of the warehousing system.

The New York Board of Trade has adopted a remonstrance against the bill, and quite a number of our manufacturers are opposed to many of its features, as they believe it is too radical and complicated.

UNPRODUCTIVE CONSUMPTION OF WEALTH.

When a dollar's worth of powder is placed in a cannon and burned, the only products are noise and smoke, and these have no commercial value—they are not wealth—the consumption of the value that was in the powder is unproductive consumption. If a man's house, worth $5,000, is burned down, this amount of wealth is consumed, without any corresponding reproduction, and the wealth, not only of the owner, but of the community and of the world, is diminished to this extent. While an industrious man is wearing out a pair of boots, he is engaged in producing as much wealth, either in the same or some other form; but while an idle spendthrift is wearing out a pair of boots he is not producing a corresponding amount of value, and he is consequently diminishing the wealth of the country. A man, however, who is living in idleness on the interest of his money, is not necessarily impoverishing the community. On examination, it will be found that what is called *money* at interest really exists in the form of manufactories or machinery or stocks of goods, or cattle, or plows, or some other form of property, which, in the hands of active men, is aiding in the production of wealth. The man who accumulated it, and has loaned it to these business men is not living on the community when he is living on his interest. By means of the tools which he has made the community is producing an increased amount of wealth greater than the quantity which he consumes. But the spendthrift who is living on his capital is impoverishing the community. He is consuming wealth without any corresponding reproduction. This is the case also with gamblers, and thieves, and all who do not earn an honest living, either by their exertions or by their capital. When a man is producing more wealth than he consumes, in other words, living within his income, he is adding to the wealth of the world; and when a man is consuming more wealth than he produces, in other words living beyond his income, he is diminishing the wealth of the world.

AMERICAN COAL.

There is no better test of the advancement of our country in manufactures and commerce than the quantity of coals which are annually raised from our mines. Judging by this standard, the coal product of our mines for 1860 affords us a most cheering and delightful evidence of the great progress our country has made since 1850. In that year, the anthracite coal product was 3,321,126 tuns, while in 1860 it was no less than 8,131,234 tuns, thus showing that the quantity has been more than doubled in ten years by 1,488,962 tuns. By late statistics we learn that the annual coal product of England is about 60,000,000 tuns—an immense quantity; but we are rapidly marching up to this measure, as in 1820 there were only 305 tuns of anthracite raised in all the United States.

In addition to the above quantity of anthracite, there were probably also as many as 4,000,000 tuns of bituminous and cannel coals raised from our mines last year. We have not been able to obtain statistics of these, and so far as we have inquired, there are no reliable means of getting accurate statistics; but when we reflect how much bituminous coal must be consumed in such an iron-manufacturing city as Pittsburgh, Pa., and that this fuel is now very generally employed on the Ohio and Mississippi steamboats and in some of our Western cities, the quantity must be very large. And when we also take into consideration the great quantities of cannel coal which must be mined for making oil and gas for cities, we are perhaps warranted in fixing the annual coal product of the United States for 1860 at about 12,000,000 tuns. Success to the coal trade; our best jewels are our "black diamonds."

The Laryngoscope.—Dr. Otto Füllgraff, manager of the Homeopathic Dispensary, No. 59 Bond-street, this city, has shown to us a useful little instrument of his contrivance, for examining the throat. It consists of a highly-polished steel mirror about the size and shape of a thumb nail which he places in a handle at any angle desired, to reflect such portions of the throat as it is impossible to reach by direct rays. Any physician possessing ordinary mechanical skill can easily make an instrument of this kind, and it will be found very useful at this season, when so many are suffering from throat difficulties.

PASSAGE OF THE PATENT BILL.

Our readers will remember that a bill to amend the Patent Laws passed the Senate during the last session, and, having originated in that body, it was sent to the House, where it was amended in several particulars, and passed on the 7th inst. From a synopsis of the amendments, which we append, our readers will observe that one of the amendments provides that there shall be no extension of any patent when the Commissioner is satisfied the net profits are $100,000. This provision we hold to be very unjust, because it makes no discrimination between the value of inventions, and the genius and expense incurred in bringing them to perfection. In our next issue, we shall have something more to say upon this subject. In the meantime, the bill goes to the Senate for concurrence in the amendments:—

Washington, D. C., Feb. 7, 1861.

The Senate bill, in addition to the act to promote the progress of the useful arts, passed the House to-day with sundry amendments; one of which provides that there shall be no extension of any patent when the Commissioner is satisfied that the net profits are $100,000. All laws fixing the rates of fees to be paid, and discriminating between the inhabitants of the United States and those of other countries which shall not discriminate against the inhabitants of the United States are repealed, and in their stead certain rates established. The Commissioner is authorized to dispense in the future with models of designs, when the designs can be sufficiently represented by drawings.

Death of Dr. J. W. Francis.—We regret to record the decease of Dr. John W. Francis, of this city. The sad event occurred on the the 8th inst., after a lingering illness. At his death Dr. Francis was 72 years of age, all of which had been spent in New York, where he was born in 1789. For quite a number of years he had been considered an encyclopedia of anecdote, relating to New York manners and customs of years long since departed. He was highly educated in his profession, and was a prolific writer of much ability on medical subjects. His tastes, as well as his profession, led him to become acquainted with all the most noted literary characters in this country, and many of the most distinguished Europeans. His memory was prodigious, his conversation gifted, his heart genial and his tastes cultivated. He was a genuine old Knickerbocker, highly esteemed as a public man, a private citizen, a physician and a man of letters.

Death of Dr. Alfred Freeman.—We also regret to notice the decease of Dr. Alfred Freeman, of this city, on the 8th inst., at the age of 68 years. He was one of the most celebrated homeopathic physicians in America, and was distinguished in his profession for great ability and successful practice. And while he was greatly honored in his profession, he was also estimated by all who knew him as a good man—a Christian. He has left behind a large circle of relatives and acquaintances, who do not sorrow without hope, for they believe that his spirit has gone to "the better land."

McCormick's Patent Extension.—A joint resolution has passed both Houses of Congress extending the time for the Acting Commissioner to take testimony relating to the extension of McCormick's patent on reaping machines. Those opposed to the extension petitioned for this resolution. The hearing before the Commissioner was to have taken place on the 11th instant, and further time had been refused to the opponents of the patent, which patent does not expire until the 23d of October next. Such an early hearing for an extension was unusual.

After some hesitation, we have decided to make room for the reply of Professor Sprague to Professor Silliman, but we respectfully remind the learned disputants that, as they agree exactly in regard to facts and principles, and are contending only about the meaning of a word, though the discussion might interest that very small number of persons who make the study of philology a speciality, it will hardly be deemed of primary importance by the great mass of the readers of the Scientific American. If, therefore, these gentlemen favor us with further communications, we shall be more likely to consider them acceptable to our readers if they are directed to the elucidation of some principle, or the plain and simple statement of some new fact in science.

Somebody says—Cork screws have sunk more people than cork jackets will ever keep up. We believe it.

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THE POLYTECHNIC ASSOCIATION OF THE AMERICAN INSTITUTE.

[Reported for the Scientific American.]

The usual weekly meeting of the Polytechnic Association was held, at its room in the Cooper Institute, this city, on Wednesday evening, Feb. 6, 1861. The President being absent, Mr. John Johnson was called to the chair.

PROJECTILES.

Mr. J. R. HASKELL made an explanation with regard to the accelerating cannon. He had understood that the statement was made by a member, in the debate upon a former evening, that the principle of acceleration would lessen the recoil of the gun, but that there would be a loss of power attending it. He wished to correct that statement. He proceeded to give the details of various experiments which had been made with this cannon. The first experiments were made with a rifle, made upon this principle: Of such a calibre as to carry round lead bullets, 95 to the pound. Having charged the barrel as heavily as it would bear, without changing the accelerators, the ball penetrated 2 feet in spruce plank. Applying the same charge, with the same kind of a bullet—he charged also the two accelerating chambers—and the resulting penetration was four feet of spruce timber and one foot of oak timber; certainly showing no loss of power. He proceeded to give the results of the range of the Armstrong and Whitworth guns, at different elevations; which he compared with the results obtained at Old Point Comfort, Va., with one of the accelerating guns, carrying a shot weighing 7⅝ pounds; showing that the latter had a decidedly longer range, although carrying a lighter shot.

Mr. STETSON inquired whether the vertical variation of the accelerating gun was any greater than with other guns.

Mr. HASKELL replied that that point had not been ascertained. In one case, two successive similar charges, with the same elevation, had resulted in the ranges of 2,785 and 2,734 yards respectively. With perfect shot, and with the same kind of powder, he should expect the range to be as uniform as with any other gun. The government subsequently ordered another gun of six inches bore; but had never spent a dollar to test it after it was finished. The accelerating gun is fired like an ordinary cannon, the heated gas from the powder inflaming each successive charge as the ball passes by it.

Mr. BABCOCK stated that during the past week, he had had an opportunity of examining somewhat the new projectile of General James, of Rhode Island, upon which the War Department has expended many thousand dollars. The target, placed 2,000 yards from the gun, is 17 feet long and 13 feet high; and it has as yet but 10 shot walks upon it; and it did not strike him as indicating any extraordinary excellence in the piece. The fore part of the shot is solid; but the rear is honeycombed, with passages from the butt end to the sides. A band of tin, another of lead, another of heavy tin, and another of tallowed canvas, surrounded the rear of the ball; and these are expanded so as to fit the gun by the action of the expanding gases. At the muzzle of the gun this packing flies off in all directions, some of the pieces taking an angle of about 60°. The reaction of these pieces, unless they flew off equally in all directions, which would not be likely to occur, would tend to throw the shot out of its course. In one instance the shot had been known to strike a fourth of a mile out of the direct range.

The CHAIRMAN—With the amount of powder you used, did you come up to the standard effect, the same as if it had been placed in one charge?

Mr. HASKELL—We did not try that. It would have blown the gun all to pieces.

[The statement of Mr. Garvey in the former debate, was undoubtedly intended to refer to the amount of propulsive power to be obtained from a certain quantity of powder, there being a loss in dividing it into three charges, instead of putting it all into one. It was not therefore inconsistent with the statements of Mr. Haskell.—REPORTER.]

BALANCING MILLSTONES.

Mr. DANIEL HAMAKER, jr., of Lancaster, Pa., exhibited a model of Fellenbaum's method of balancing millstones; the principle being the application of the balancing weight upon the periphery of the stone, below the point of suspension, instead of upon the top of the stone as heretofore practiced. The stone will thus be balanced whether running or standing.

EXPERIMENTS IN ROTATION.

Dr. VAN DER WEYDE explained the effect of rotation in certain cases. If a cannon ball, made spherical, rotates, its rotation will be about its center of gravity. But the impulsion from the powder is given to the center of its mass. If the center of its mass does not coincide with the center of its gravity, there will be produced a rotation about that center of gravity, so that the front of the ball will move toward the side upon which the center of gravity is located, and the ball will deviate in its course, in that direction, from a straight line. Thus, if the center of gravity is above the center of the ball, it will tend to elevate the ball, and thus make its range greater than it would otherwise be. If, however, a body is not spherical, the tendency is to rotate about its shortest axis; and if a body is made to rotate about any other axis, it will change its axis of rotation. Dr. V. illustrated this principle by various experiments. An oblate spheroid, suspended from one side, when made to rotate rapidly, rose so as to revolve horizontally about its shortest axis. A double cone, suspended at one end, rose in like manner into a horizontal position. A ring, suspended at one side, did the same. A spherical glass vessel containing a small quantity of mercury being caused to revolve, the mercury rose and formed a horizontal belt upon the inner surface of the glass. Another similar sphere contained mercury and porter; and the mercury formed a belt as before, and the porter, being lighter, formed a belt within it, lapping over it above and below. A chain, with the ends fastened together, first opened into the form of a ring, and then assumed a horizontal position. In all these cases, the axis of rotation was perpendicular, being produced by revolving the point of suspension around a perpendicular axis, and the bodies moved in opposition to the force of gravity, so as to make that perpendicular axis coincide with their shortest axis.

FUEL.

Dr. STEVENS resumed the discussion of the subject of fuel. The reason why fine coal will not burn, he attributed to the want of atmospheric air. A gentleman of Boston has constructed an apparatus furnishing hot air to his furnace, and it will burn fine coal, or sawdust, at a great profit. The soft coals of Illinois and Iowa melt and run together, so that they cannot be used for a hot fire, especially for locomotives; but this may be remedied by feeding small quantities at a time; and a plan has been devised for this, making that coal as good as any other for the locomotive. In the coal regions, the fine coal of the anthracite is piled up in immense quantities. But a process has been adopted of mixing that fine coal with clay, and thus making bricks to be sent to market for combustion.

Dr. VAN DER WEYDE stated that the same thing had been practiced in Germany, where all the coal is fine, as taken from the mines.

Mr. ——— said that one objection to soft coal was, that it was so charged with sulphur as to eat the grate-bars off.

Mr. HEDRICK said that it seemed to him to be too much rather than too little air, which prevented coal dust from burning; for there was more air in coal dust than in an equal amount of larger coal.

Dr. VAN DER WEYDE thought there was a deficiency of air. It would burn around the edges; but there must be two pieces together, with a current of air between, in order to make coal burn; and with fine coal the air could only pass around the edges.

Mr. DIBBEN said that there was more air in fine coal than in larger coal, for a ton of it occupies more space; but at the same time the interstices are so irregular, and the air has to make so many turns, that there can not be a draft of fresh air through it. With a proper grate and a proper blower, the pea coal, or the dust coal even, are good and economical fuel. A ton of fine coal will give more heat for a boiler than a ton of coarse coal; for it will make a better fire, and as the heat is absorbed by the boiler in proportion to the difference of temperature between the boiler and the fire, the hotter the fire the greater is the proportion of the heat taken up by the steam. For burning pea coal a smaller grate and a smaller fire place are required for the same consumption of fuel.

Mr. VEDDER described a successful experiment he had made in burning pea coal, at $2 per ton, when other coal was worth $11 per ton. He considered it necessary to admit air upon the surface of the coal.

Mr. M. HASKELL stated that a patent had been secured for mixing coal dust with pitch or tar, so as to make it available as coal.

Mr. ROWELL had tried some of the bricks made from coal dust and clay, and he could not even boil water with them.

Mr. DIBBEN considered the plan of mixing the coal dust with an incombustible substance as impracticable, as it divides instead of concentrating the combustible material.

Dr. VAN DER WEYDE stated that the smoke from the factories in London had become a nuisance; but Parliament passed an act that there should be no more smoke, and the result was that, by feeding the fire from below, they burned all their smoke.

Mr. GARBONATI remarked that, while the manufacturers at first regarded this act of Parliament as offensive, they soon found that it was an advantage to them to burn their own smoke, as a matter of economy in the consumption of fuel; and now the private houses are, of their own accord, adopting the same principle.

Dr. VAN DER WEYDE said that engineers might always burn their smoke with their present furnaces, if they would push the live coal back and feed the coal in front, so that the smoke and carbonic oxyd should pass over the hot coal.

Mr. SEELY said that, in the method of decomposing water for fuel, in addition to the loss of heat in the decomposition equal to that derived from the burning of the hydrogen gas, there is a serious loss of heat from the necessity of first converting the water into steam. Yet, where it is desirable to produce a flame, it might be an advantage to obtain it in this way. In the ordinary stove a great saving of fuel might frequently be effected by admitting a little more air. If the products of combustion go off as carbonic oxyd, one half the heat is lost. Even lifting the cover of a common cylinder stove will frequently admit air enough to consume the carbonic oxyd which would otherwise escape without combustion.

Dr. STEVENS stated that if coal could be consumed at a low degree of heat, clinkers would not be formed.

Mr. VEDDER inquired whether the decomposition of water poured upon a very hot fire tended to increase the heat.

Messrs. Hedrick, Van der Weyde and Seely replied in the negative.

Mr. BRUCE had constructed ovens at a considerable expense, so that the steam from the bread should be decomposed in the fire to increase the heat; but did not know whether he had gained by it.

Mr. SEELY said that, as the steam was already formed, their might have been an advantage in its producing more flame.

Mr. PELL stated that, at the next meeting, he would like to occupy twenty minutes upon the subject of fuel.

The subject selected for next Thursday evening is, "Compressed Air, and its Use in Propulsion," proposed by Mr. Stetson.

On motion, the meeting adjourned.

Recent American Inventions.

The following inventions are among the most useful improvements lately patented:—

ENEMA SYRINGE.

The object of this invention (patented by George W. Hubbard, of New York city) is to obtain a simple, efficient and very portable instrument for enema-giving purposes, and one which will admit of being applied and operated by the patient alone with the greatest facility. Syringes of this class (those most used) are constructed with an elastic or collapsable chamber and a nozzle, the liquid being expelled from the chamber by simply compressing the same. This is a very simple instrument, but not by any means an economical one, as the chambers, which are of india-rubber, sometimes rupture, and the instrument is rendered worthless. Mr. Hubbard's invention is constructed in a very simple manner, but it admits of a durable instrument being furnished at a moderate cost, and one, it is believed, which may be used with greater facility than the ones previously mentioned.

SEWING MACHINE.

This invention was patented by Josiah M. Smith, of Somers, N. Y., and relates more especially to ma-

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chines of that well known class using two needles—one carrying its thread through the cloth or other material to be sewed, and the other working entirely on one side of the material, and each carrying its thread through a loop in the other thread, making what is known as the double-looped stitch. The first improvement consists in the employment in a sewing machine of the class above mentioned, of a hook, so applied and operating as to open and extend the loops of the under or locking thread in such a manner as to insure the passage through them of the perforating needle, and to release them at a speed so proportioned to the speed of the other working parts of the machine as to keep a proper tension of the thread throughout the whole process of making a stitch, the said loop being also so made that it shall serve the additional purpose of forcing and holding back upon the under or locking thread needle, the loops of the thread of the upper or perforating needle, during such stages of the operation of producing the stitch as is required. The second improvement consists in a presser operating upon the cloth or other material independently of the feed apparatus, with a percussive and sliding or rubbing action, for the purpose of pressing or, as it were, "ironing" down the seam and compressing the threads together. This improvement is applicable to sewing machines of various kinds, but with more especial advantage to machines which make their stitches by the enchainment of loops formed in one or more threads.

IRON SHUTTERS.

This invention relates to an improvement in that class of iron shutters which are arranged to roll over shafts placed in the building directly over the windows or doors. The invention consists in hinging the several slats of the shutter together in such a way that they may turn over or roll in a direction toward the front—or in other words, roll on thier face—and thereby admit of the roller or shaft being placed in the hollow cast metal lintels over the doors and windows, so as to avoid the trouble and expense of constructing special chambers in the wall for such purpose. John S. Cochrane, of New York city, is the inventor.

SIZING SILKS.

This invention consists in a device composed of two surfaces arranged to oscillate together about the same axis, and so adjusted, in relation to each other, that the finer or thinner portions of a thread may be drawn freely between them without moving them from a fixed position, but that the coarser or thicker portions may, by passing between them, produce sufficient friction to move them about the aforesaid axis to another position, and hold them in the latter position until a thinner or finer portion presents itself, when the said surfaces will fall back to the first mentioned position. This invention was patented by Goodrich Holland, of Willimantic, Conn.

LIGHTING AND EXTINGUISHING GAS.

The object of this invention is to effect the turning on and ignition of illuminating gas, and the shutting off of the same at such hours as may be desired, without any personal attention further than its adjustment from time to time to suit the changes in the times of the setting and rising of the sun and moon, or other circumstances. The apparatus is composed principally of the hydrogen and platinum kindling apparatus known as "Dobereiner's lamp" and a clock, so applied in combination with each other, and with suitable valves for letting on and shutting off both the hydrogen and illuminating gas, as to effect the desired result. Newton S. Manross, of Hartford, Conn., is the patentee of the above invention.

CARPET TACK DRIVER.

This invention is an instrument to be used in tacking down carpets, for holding the carpet, grasping and directing the tack, and for driving the tack by a simple lever motion. The nature of this invention consists, first, in the combination of a lever with a vertical spring rod or hammer, arranged in a suitable frame having projecting from its base suitable claws or points for holding the edge of the carpet while the same is forced to its proper place for tacking down; second, in combination with the lever or spring rod on the hammer, of a jointed spring toe on the lever and a grooved collar on the spring rod, whereby the spring rod may be raised to a certain point and then released, and the end of the lever will be allowed to pass under the grooved collar for elevating the spring rod at pleasure; third, in two pivoted spring jaws, in combination with the spring hammer rod, for holding the tack and for guiding the same to its proper place in the floor when struck by the hammer rod. This ingenious invention is due to Henry S. Walcott, of East Boston, Mass.

FIREARMS.

Benjamin T. Babbit, of New York city, has invented an improvement in ordnance and firearms, the object of which is to prevent the overheating of the same by repeated firing, and, to this end, consists in the employment of a tube or casing surrounding the barrel in such a manner that there is formed around the latter, between it and the said tube or casing, an annular passage through which a violent and copious rush of air is produced in a forward direction by the discharge of the piece, such rush of air having the effect of cooling the barrel in some degree after every discharge.

PUMP.

This invention, patented by Thomas Hansbrow, of Sacramento, Cal., consists in a certain new and useful arrangement of its valves and valve seats, for the purpose of simplifying the construction of the pump and to increase its effect.

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FOR THE WEEK ENDING FEBRUARY 5, 1861.

Reported Officially for the Scientific American.

*** Pamphlets giving full particulars of the mode of applying for patents, size of model required, and much other information useful to inventors, may be had gratis by addressing MUNN & CO., Publishers of the SCIENTIFIC AMERICAN, New York.

282.—G. C. Aiken, of Worcester, Mass., for an Improved Heel Attachment to Boots and Shoes:

I claim the combination of the groove metal part, A, with the rubber or elastic part, B, substantially as and for the purposes set forth.

283.—J. B. Aiken, of New York City, for an Improvement in Knitting Machines:

I claim the construction of the framing with jaws, B C, ring, A, and piece, D, in the manner shown and described.

[The object of this invention is to construct a circular knitting machine in a convenient, compact and portable form for family use, without any cumbrous framing, and the invention relates to the furnishing of such a machine with a screw clamp, by which to attach and secure it to an ordinary table, and to the construction of the framing of the machine, in such manner as to provide for such mode of attachment.]

284.—John Albert, of Philadelphia, Pa., for an Improvement in Tuning Pegs for Violins, &c.:

I claim the pin, B, its tapering head, b, and nut, c, in combination with the handle, D, and tapering projection, E, the whole being constructed and applied to a violin or other stringed instrument, substantially as and for the purpose set forth.

285.—Tyler Andrews, of North Easton, Mass., for an Improvement in Adjusting Coupling Links of Railroad Cars:

I claim the application and arrangement of the link lifter and supporter composed of the bar, A, and lever, C, with the railway carriage, draw bar, substantially in the manner and to operate the link, as specified.

286.—Frederick Ashley, of New York City, for an Improved Ice Chair:

I claim the combination of a flexible frame, with runners, the whole constructed substantially as and for the purposes set forth.

287.—B. T. Babbitt, of New York City, for an Improvement in Ordnance:

I claim the employment of a tube or casing, B, surrounding the body or barrel of a piece of ordnance or firearm, substantially as and for the purposd specified.

288.—G. H. Babcock, of New York City, for an Improvement in Apparatus for Mitering Printers' Rules:

I claim the combination of an adjustable steel templet with a vise, or their equivalents, constructed and operating substantially in the manner and for the purpose described.

289.—N. R. Baldwin, of Afton, N. Y. for an Improved Cart:

I claim the pivoted levers, D D, connecting the movable bed or frame, C, to the axle-tree at c' c', and the cart body to the bed or frame, C, at e e, substantially as described.

I also claim, in combination with the bed, C, having a longitudinal movement on the axle-tree, the cross piece, L, rod, h, spring, j, brake bar, K, jointed rods, l l, staples, n n, and blocks or rubbers, k k, combined and operating together, as and for the purposes set forth.

I also claim the bar, J, pivoted to the front part of the cart body, springs, H H, and crosstree, G, in combination with the jointed shafts, C' C', as and for the purpose set forth.

[This invention consists in attaching the bed of the cart body to two bolsters which are secured to the axle by jointed levers which allow the bed to have a longitudinal motion on the axle; and in conjunction with this arrangement, it consists in pivoting the cart body to the inner ends of the aforesaid levers, so that when the horse is drawing the cart down hill, the levers will move the cart body backward sufficiently far to counterbalance the downward increased pressure on the shafts, which are attached to the bed of the cart body, and in going up hill the levers will move the cart body forward, so as to bring the weight nearer to the horse. The invention also consists in attaching the brakes to a transverse bar which is under the bottom of the cart body, and near its front end, and in applying to this brake bar a spring or springs which yield, and prevent jar and concussions to the cart body, in consequence of the brakes being applied to it.]

290.—T. J. Bottoms, of Thomasville, Ga., for an Improvement in Horsepowers:

I claim the manner of adjusting the gearing by means of the sliding boxes, g, crosspieces, h, screw, e, and nuts, d and f, in combination with the gearing, as arranged, the whole operating as described and for the purposes set forth.

291.—J. C. Briggs, of Concord, N. H., for an Improved Guard to Flat Irons:

I claim the combination of the cover or reflector, made substantially as described with a flat iron or sad iron, as and for the purposes described.

292.—Ebenezer Cate, of Franklin, N. H., for an Improved Horse-shoe:

I claim forming or constructing a horse-shoe with a thin internal web, A, in combination with a grooved continuous calk, substantially as set forth.

293.—N. W. Clark, of Clarkston, Mich., for an Improvement in Journal Boxes:

I claim, in combination with a metallic journal box, the filling of the same with wood for the journal bearings, when arranged and secured, substantially as described and represented.

294.—P. C. Clark, of Reading, Pa., for an Improvement in Fountain Pens:

I claim the conducting rod, when said rod is provided with an elongated flexible or elastic valve and conducting strings, when constructed as described and for the purpose set forth.

295.—DeWitt Clint and Ives Lynd, of Poestenkill, N. Y., for an Improvement in Machines for Digging Potatoes:

We claim the combination of the scoop, A', the adjustable reciprocating screw, O, the above parts being applied to a mounted frame, A, and all arranged for joint operation, as and for the purpose set forth.

We further claim the connecting of the rod, P, to the lever, Q, by means of the link or loop, r, as shown, in combination with the screen, O, and in the manner and for the purpose specified.

[This invention consists in the use of an adjustable scoop, in connection with an adjustable reciprocating screw, the above parts being placed on a mounted frame and so arranged that the potatoes, as the machine is drawn along, are dug from the hills or drills, separated from the earth and deposited on the top of the ground, the work being performed in an expeditious and perfect manner.]

296.—J. S. Cochrane, of New York City, for an Improvement in Rolling Iron Shutters:

I claim connecting together the slats, A, of the shutter, by means of the hinges, B, curved and bent and attached to the slats, so us to have the position relatively therewith, as shown, to operate as and for the purpose set forth.

297.—Eleazer Coffin, of Indianapolis, Ind., for an Improved Dove-tailing Machine:

I claim the cutters, C C E, and O, operated in connection with the slots and pins, Z Z, head guide, B, sliding bar, A, connection rod, T, lever, S, connection rod, R, crank, Q, and the cam, K, pitman, X, and sliding bar, L, or their equivalents, as set forth.

298.—J. A. Crandall, of New York City, for an Improved Rocking Horse:

I claim, first, The adjusting device, a b e, in the described combination with the shaft, B, springs, C C, and seat or horse, A, to regulate the tension of the springs, as set forth.

Second, The arrangement and combination of the springs, C E, and seat or horse, A, with the connecting rod, K, and axle, J, of a velocipede, substantially as shown and described, whereby the springs will assist the crank, I, in passing its centers.

Third, Having the stirrups, M, and their straps connected with the steering axle, substantially in the manner shown and described, so that the velocipede may be guided by the stirrups, all as set forth.

[This invention consists in attaching a child's toy riding horse, or any receptacle or seat which will hold a child to a shaft by means of springs, whereby a very agreeable rocking motion is produced by a very slight exertion of the child, and a toy or implement obtained which possesses several advantages over the ordinary toy rocking horse. The invention also consists in combining with the spring attachment above specified, a frame mounted on wheels and arranged with a crank and connecting rod and steering device, whereby the toy or implements may be used as a receptacle when desired.]

299.—T. S. Davis, of Jersey City, N. J., for an Improvement in Pistons and Piston Valves of Steam Engines:

I claim the construction of a piston valve or other piston with a single expanding ring, A, having the head, B, and follower, C, fitted to its interior, and furnished with one or more dovetail wedges, D, all substantially as described, whereby it is made to have the character of a solid block, but yet capable of being expanded in a lateral direction.

[This invention is more particularly designed for piston valves, but may also be adopted for other kinds of pistons. It consists in a certain construction of a piston, whereby it is made as much as possible like a solid block, yet capable of being set out to fit the cylinder in which it works, and compensate for wear.]

300.—Jules Duval, of New Orleans, La., for an Improvement in Defecating Saccharine Liquids:

I claim the process set forth, consisting in the successive application of the described substances to cane juice or other saccharine liquids, substantially in the manner and for the purpose specified.

[This invention consists in the use of liquid sulphurous cord, in combination with saccharate of lime and with a solution of pure sulphate of alumina, for the purpose of defecating and deodorizing saccharine liquids.]

301.—Solomon Dwight, of Byron, Ill., for an Improvement in Cultivators:

I claim the arrangement of the main frame, A, and tongue, B, of a single piece of timber, in combination with the retaining strap, C, shaping block, D, cross-brace, H, and standards, E, the whole arranged and operating as specified for the purpose set forth.

302.—Otto Eberhardt, of Brooklyn, N. Y., for an Improvement in Flower Pots:

I claim the flange, a, on the pot, with its notches, b b b, in combination with the corresponding knobs or projections, c c c, on the saucer relatively arranged and operating as and for the purposes set forth.

[The object of this invention is to provide a simple means whereby a flower-pot can be easily attached to its saucer, and detached therefrom at pleasure, so that when desirable, the saucer may be secured to the bottom of the pot for giving additional base to the pot, and for retaining dirt and water escaping from the pot.]

303.—J. Fielemeyer, of Philadelphia, Pa., for an Improvement in Apparatus for Cutting Ice:

I claim the employment for cutting ice of a weight, E, with chisels, e e, when the said weight is arranged to be moved in vertical grooves, a a, increasing in width at their lower ends, as set forth for the purpose specified.

304.—Charles Fleming, of Ypsilanti, Mich., for an Improved Instrument for Measuring Lumber:

I claim the combination with the index shafts, A B C, connecting gearing and perambulating wheel, P, of the spring, index, Q, pivoted at S, retained in position by the pivot X, and adapted to press upon face of the wheel, P, the said parts being constructed and operating in the manner and for the purposes shown and described.

305.—F. M. Gibson, of Chelsea, Mass., for an Improvement in the Joints of Felloes in Carriage Wheels:

I claim the improved felloe joint supporter, as constructed, with the tongue or projection, b, arranged with respect to the socket piece, D, substantially as specified.

I also claim the above specified arrangement and application of the felloe supporter, D, its tongue, b, a spoke, C', the felloe, A, its joint, e, and the tire, B, the whole being to operate in manner and for the objects as specified.

306.—S. D. Goodale. of Cincinnati, Ohio, for an Improvement in Stereoscopes:

I claim, first, The arrangement of shaft, H, wheels, I I, and collar, M, scene holder, J K K', spring, L, and detent, N, or their equivalents, the whole operating together to instantaneously shift the scenes, substantially as set forth.

Second, The arrangement of hinged lens holder, E, diffusing glass, F, and reflector, G, adapted to be extended for use or compactly folded within the case, in the manner represented.

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307.—H. B. Goodyear, of New Haven, Conn., for an Improved Method of Relieving Geographical Outlines on Molded Elastic Globes:

I claim the method described of constructing an india-rubber or gutta-percha ball of the character specified, by first inscribing and indenting, as set forth, the several characters or divisions to represent a celestial or terrestial globe in a metallic or other suitable core, and afterward forming a matrix from the same wherein and whereby to mold the ball, as described.

I also claim the method described of printing or lettering the interior of the matrix used to form the ball with type of convex configuration, or set in conformity with the concave configuration of the matrix, essentially as set forth.

I also claim the method of constructing a hollow india-rubber or gutta-percha ball with its exterior surface marked or divided to represent a terrestial or celestial globe, having its land or sea surfaces, objects or divisions, appearing and standing in relief, but flush with the general surface, and whereby the rotundity of the ball is preserved, substantially as described and set forth.

308.—T. Q. Hall, of Fairfield, Iowa, for an Improved Extension Table:

I claim the arrangement of the folding rails, F G H, of an extension table, with the legs of said table, when constructed, arranged and operated substantially in the manner and for the purpose described.

I also claim, in combination with the extension rails described, the extension leaves provided with oblique cleats, for the purpose of making a braced rule joint, and thus bracing the extended table against lateral motion, substantially as described.

309.—J. A. Hammer and J. P. Gordon, of Lisbon, Iowa, for an Improvement in Mole Plows:

I claim the arrangement of the coulter, D, and blade, G, both being hinged to the mole by means of pivots, b and c, and connected at the top by flanges, d and f, and screw, e, as described, in combination with the lever, E, and guide pin, K, for the purpose of a double adjustment, as set forth.

[This invention consists in the combination with the adjusting lever, of a toothed arc, pinion, notched disk, dog and crank, for the purpose of adjusting the mole to the desired depth, and also in arranging the adjusting lever with a friction roller in its end, which, in combination with a round pin behind the coulter, serves to facilitate the up-and-down motion of the latter.]

310.—Thomas Hansbrow, of Sacramento, Cal., for an Improvement in Pumps:

I claim the arrangement of the inclined valves, f, seat, g, and suction pipe, H, above and with the cylinder, A, and piston, G, in combination with the sliding plate, F, and oscillating armed lever receiving piece, D, in the manner and for the purposes shown and described.

311.—Charles Hardy, of Biddeford, Maine, for an Improvement in Machinery for Grinding the Card Teeth of Carding Cylinders:

I claim extending and adjusting the shafts, G and E, in the manner represented, whereby I am enabled to cause the grinder, D, to traverse and retraverse all of the teeth of the cards with its entire breadth, substantially as specified.

312.—Goodrich Holland, of Willimantic, Conn., for an Improvement in Machines for Sorting Silk and other Threads:

I claim the employment, in silk-sizing machines, of oscillating sizing arms, I I, constructed and operating substantially as shown and described.

I also claim the combination of said oscillating arms, I I, with shaft, H, and arm, J, substantially in the manner shown and described.

313.—M. A. Howell, Jr., of Ottowa, Ill., for an Improvement in Mole Plows:

I claim, first, In combination with a drain or mole plow, a movable sickel, rasp or saw, inserted in or annexed to a coulter thereof, for the purpose set forth and substantially as described.

Second, In combination with a machine for underground draining the application of a segmental wheel acted upon by a screw, both of which are fixed horizontally upon the beam of the machine, for the purpose of giving a curvilinear motion to the machine in contradistinction to the great power applied by a capstan.

Third, In combination with a mole plow, a jointed shoe, hinged and swung to the lower side of the beam thereof, and a lever by which to control its motion, for the purpose set forth and substantially as decribed.

314.—G. W. Hubbard, of New York City, for an Improvement in Enema Syringes:

I claim a syringe constructed in the particular manner shown and described, so as to operate as set forth.

315.—Charles Hughes, of New Orleans, La., for an Improvement in Hoop Locks:

I claim a hoop lock button, made in the peculiar manner shown and described.

316.—F. G. Johnson, of Brooklyn, N. Y., for an Improvement in Locks:

I claim, first, The open cylinder, Fig. 4, comprised of the two circular head pieces, A and B, and the studs, a a a, set in a circle, and all working on the central post, C, substantially in the manner and for the purpose described.

Second, The series of cylindrical tumblers, e e e, arranged in a circular position on their studs, a a a, in combination with the spiral springs, o o o, so as to allow the said cylindrical tumblers to be depressed by the key and returned by the springs, substantially in the manner and for the purposes set forth.

Third, The combination together of the cylinder, Fig. 4, and the series of cylindrical tumblers, e e e, and spiral spring, o o o, acting in relation and combined with the series of guards, m m m, or their equivalents, in the manner and for the purpose described.

Fourth, The general arrangement together of the cylinder, Fig. 4, tumblers, e e e, arranged in a circular position, and spiral springs, o o o, combined together and with the bolt, K, and its arm, J, in such a manner that, by placing the whole on the central post, C, the entire combination of these parts can be worked or rotated freely and simultaneously on the central post, C, to lock and unlock the lock by the mere action or use of the key, substantially in the manner as described.

317.—Joseph Jordan, Jr., of East Hartford, Conn., for an Improvement in Mills for Grinding Paper Pulp:

I claim the arrangement of the knives of either grinder, they being disposed in rows, series or sections, extending transversely around the grinder, and having their knives so further arranged that those of one section or series shall be so generally or wholly out of range with those of the next series, that each channel between any two next adjacent knives of one series may, at its end next adjacent to the other series, open into two or more of the channels of such series.

Also, The above described improved mode of arranging the knives of both grinders, whereby those of the male grinder may be employed to advantage, in manner as described, to sharpen the knives of the female grinder, such arrangement of the knives being exhibited in Figs. 4 and 6; and when the knives of the male grinder are arranged into two or more series, each of which shall extend transversely around the grinder, as described, I claim the further arrangement of the knives in such manner that those of each series from the smaller to the larger end of the grinder shall be at less distances apart than those of each series preceding it, the same being substantially as exhibited in Fig. 6, and as described.

318.—N. S. Manross, of Forrestville, Conn., for an Improved Apparatus for Lighting and Extinguishing Gas Lights:

I claim, first, The employment, for the purpose of lighting gas at any desired hour, of a hydrogen and platinum kindling apparatus (Doberciner's lamp) and a clock movement, combined and operating substantially as described.

Second, So constructing and applying the cam, T, or its equivalent, and so applying the mechanism through which it acts on the hydrogen valve and illuminating gas valve, that the hydrogen valve, after the ignition of the illuminating gas has been effected, will be closed, and the illuminating gas valve only left open, substantially as described.

Third, Providing for the protection of the platinum by means of an automatically opening and closing box, K, substantially as described.

Fourth, The rotating dial, W, with its two adjustable pointers and two attached trippers, applied and operating substantially as described.

319.—A. Z. McBride, of Hannahatchee, Ga., for an Improvement in Cotton Presses:

I claim the combination of the screws and tap, A, with its follow block, 10 and 11, when constructed and operated substantially as described.

320.—William Murkland, of Lowell, Mass., for an Improvement in Looms:

I claim, first, The combination of the reserve shuttle boxes with the active shuttle boxes, by attaching and detaching the several reserve shuttle boxes to and from the active shuttle boxes, under a construction and mode of operation substantially as set forth.

Second, I also claim the adjustment of the reserve shuttle boxes with the active shuttle boxes, so as to allow the use of one or more of the active series, substantially as described.

Third, I also claim the construction and use of the annular disk for the purpose of keeping the shuttle in place, and for passing the ends of the yarns around the axis of the polygonal box frame.

Fourth, I also claim the manner of holding the boxes of the polygonal frame in their position, by means of a segment of a circle or its equivalent.

321.—Francis Nivelle, of Paris, France, for an Improvement in Sewing Machines:

I claim the arrangement of the shuttle-operating levers, O N, and rocker, M, and of the oscillating and reciprocating under needle shaft, P, and its operating lever, Q, rod, R, and connection, u s, in combination with cams on a driving shaft, C, arranged above the upper frame of the machine, substantially as described.

[This invention consists in an improved arrangement of the parts of the sewing machine to obtain a machine of simple construction, capable of working either the shuttle stitch or the double loop stitch.]

322.—J. B. Peyton, of Raymond, Miss., for an Improvement in Flues for Cotton Gins:

I claim constructing the flue, A, with a sheet metal bottom which has greater spaces between the perforations than the length of the fibers, as and for the purposes shown and described.

[The nature of this invention relates to a novel method of cleaning cotton and freeing it from motes, dust, and other impurities which are left in it after the ginning operation. The invention consists in the employment of a metallic flue box which is attached to the flue space of an ordinary cotton gin, said flue box having a perforated bottom and a dust sack suspended under it.]

323.—Jacob Reese, of Pittsburgh, Pa., for Improvements in the Construction of the Fire Chambers and in Operating the Fires of Reverberatory Furnaces:

I claim, first, Constructing the fire chamber of reverberatory furnaces for puddling, boiling or reheating iron, in which coal is used as fuel, so as to form at its base a contracted receptacle for the accumulation of the melted cinder below the point where the blast of air is admitted, in combination with a close, air-tight fire chamber bottom, for the purpose of freeing the fuel of its incombustible particles by keeping the cinder in a melted state so long as it remains in the fire chamber, and thus preventing the formation of clinker, as described.

Second, Fluxing the clinker in the fire chamber of a puddling, boiling or reheating furnace, constructed as above described, by means of the introduction with the fuel into the fire chamber, of oxyd of iron or other suitable flux, for the purpose of keeping the clinker in a state of fusion so long as it remains in the fire chamber bottom, so as to enable it to run off spontaneously as it accumulates, in the manner hereinbefore described.

Third, In the fire chamber of puddling, boiling or reheating furnaces, constructed as above described, introducing the blast near the surface of the melted cinder so as to beat the blast before it ascends through the mass of fuel in the fire chamber and thus increase the intensity of the combustion and consume the smoke, as set forth.

324.—Ira Reynolds, of Bellefontaine, Ohio, for an Improvement in Straw Cutters:

I claim, first, The arrangement of the crank between the arm, f, and blade, C, with the rockshaft, K, and feed motion, as and for the purposes described.

Second, I claim constructing the journal box, E, in such a manner as to form the box for the lower roller and the sliding or slotted box for the upper feed roller, with slot for spring and fastening for the feed box, as seen and represented in the accompanying drawings and specification.

Third, I also claim the combination of the adjustable plate, D, and the rod, I, when constructed and operating as and for the purposes described.

325.—F. E. Schmidt, of New York City, for an Improvement in Steam Generators:

I claim the arrangement and combination of the generators, tank and reservoir, substantially as described, for the purpose of combining with the steam or vapor generated in the generators any other fluid or gases, when said combined vapors and gases exert a continual power upon a piston or its equivalent.

326.—Moses Seward, of New Haven, Conn., for an Improved Collar for Ornamental Carriage Work:

I claim, as an article of manufacture, an upset planished collar for ornamental carriage work, formed without welding or turning.

327.—Thomas Sheehan, of Dunkirk, N. Y., assignor to himself, C. D. Smith, and C. B. Moss, of Washington, D. C., for an Improvement in the Manufacture of Files and Rasps:

I claim the non-frangible files and rasps constructed and made as described and specified, whose hardness, working qualities and durability are equal to those of cast steel files and rasps.

328.—Thomas Slaight, of Newark, N. J., for an Improved Lock for Railway Cars:

I claim the bolt, C, dog, F, and side plate, D, the latter being provided with the arm, c, and all arranged to operate as and for the purpose set forth.

[This invention consists in the employment or use of a dog and sliding plate provided with suitable tumblers, the above parts being placed in a suitable case and used in connection with a bolt, whereby a very simple and effective self-locking or spring lock is obtained.]

329.—J. J. C. Smith, of Philadelphia, Pa., for an Improvement in Machines for Cutting Type:

I claim the arrangement of the adjustable gage, F, and automatic jaw, G, in combination with the reciprocating cutter, C, constructed and operating substantially in the manner and for the purpose specified.

[The object of this invention is to obtain a simple and efficient machine for cutting type from a solid block the surface of which is formed into type at such distances apart that a saw may be passed through and between them without injury to the type.]

330.—J. M. Smith, of Somers, N. Y., for an Improvement in Sewing Machines:

I claim, first, The hook, M, constructed with an inclined projection, l, and notch, m, substantially as described, and applied to operate in manner substantially as set forth, in combination with the two needles, n and L, for the two purposes specified.

Second, The presser, W, applied to operate upon the cloth, independently of the feed mechanism, with a percussive and rubbing action, substantially as and for the purpose described.

331.—William Smith, of Philadelphia, Pa., for an Improvement in the Valves of Steam Engines:

I claim the arrangement and combination of the rock arm, H, lever, I, sliding plate, S, spring, L, lever, R, and piston valves, B B', substantially as described.

332.—F. W. Stafford, of New York City, for Improved Shade Fixtures:

I claim the employment or use of the adjustable strap, C, in connection with the grooved pulley, B, and cord, F, the strap being applied to the pulley to act upon the cord, substantially as and for the purpose set forth.

[The object of this invention is to dispense with the lower tightening pulley hitherto used to keep the roller cord taut. These latter pulleys cause considerable friction as well as a stretching of the cords, when new, thereby involving the necessity of a frequent adjustment of the tightening pulley.]

333.—P. P. Stephan, of Newark, N. J., for an Improved Lock Attachment:

I claim the spindle, C, provided with the bit, b, and the lug or projection, d, in connection with the key, D, and supplemental lock formed by the arbor, F, rod, k, with springs, l, and case, E, substantially as described.

I further claim the spindle, C, with its bit, b, and lug or projection d, and key, D, when used in connection with any suitable supplemental fastening or lock attachment to secure the key, D, in the lug or projection, d, and keyhole, g, of lock, A, for the purpose specified.

334.—J. V. Stevens, of Pomeroy, Ohio, for an Improved Churn:

I claim the perforated valve dash to be worked with or without a lever, substantially as set forth in the accompanying drawings and specification.

335.—J. B. Tinker, of Plymouth, N. Y., for an Improvement in Harvesters:

I claim the combination of the toothed segment, G, rack bars, E E, shaft, F, pinions, c c, bent brace rod, J, guides, K K, grooved crank-shaft, N, and feathered pinion, g, the said parts being constructed and arranged in connection with the rigid frame, A a b, wheels, C, finger bar, I, and sickle, M, in the manner and for the purposes shown and described.

[This invention relates, first, to a novel and improved means for lowering or raising the sickle or cutting device, whereby the same may be raised horizontally and bodily without affecting, in its movement, the framing of the machine nor interfering at all with the sickle-driving mechanism. The invention relates, second, to a peculiarity in the construction and arrangement of the cutting device, whereby the crank movement or stroke may be quite short and rapid cutting insured without the liability of choking or clogging, a contingency of frequent occurrence in using the reciprocating sickles.]

336.—Charles Tribby, of Winchester, Va., for an Improvement in Watchmakers' Lathes:

I claim the arrangement of the movable bed, H, in combination with the mandrel, E, drilled on one end and provided with the hollow center, b, on the other end, and with the double centered spindle, F, all constructed and operating in the manner and for the purpose described.

[The object of this invention is to facilitate the turning of such stones as are generally used for jeweling watches.]

337.—L. S. Tyler, of Linesville, Pa., for an Improvement in Rotary Harrows:

I claim, first, Connecting the harrow wheels, B B and B' B', to the frames, A A', by means of the spindle bolts, E, swivel bows, F, and axis bolts, G, as and for the purposes set forth.

Second, I also claim the described arrangement of parts whereby the harrow wheels, B B, are connected to the frame, A, and the harrow wheels, B' B', are connected to the frame, A', and the said frames are connected together by the hinged bars, C C, for the purpose set forth.

338.—J. S. Upton, of Battle Creek, Mich., for an Improvement in Horse-powers:

I claim the arrangement of the wheels, K and L, upon the shaft, J, with reference to the wheels, D and I, so that I may use more power and less speed, or the converse, at the will of the operator, substantially as specified.

339.—Frederick Walton, of Haughton Dale Denton, near Manchester, England, for an Improvement in Apparatuses for the Manufacture of Varnish. Patented in England, Jan. 27, 1860:

I claim the machine substantially as represented in Figs. 1, 2 and 3 and as above described.

340.—H. T. Watkins, of Anderson, Ind., for an Improvement in Cider Mills:

I claim the combination and arrangement of the several parts, when constructed and arranged substantially as represented, for the purpose set forth.

341.—T. S. Whitenack, of Easton, Pa., for an Improvement in Rakes for Harvesters:

I claim, first, The employment or use of the slides, G, when applied to the arms, F, substantially as shown, for the adjustment of the same as set forth.

Second, The rollers, I I' I'', when applied to the main frame, A, and used in connection with the arms, F, to operate as and for the purpose set forth.

Third, Attaching the beaters, L, and rake, K, to the arms, F, by means of the sockets, J, constructed and arranged as shown, to admit of the adjustment of the beaters and rake, specifically as set forth.

Fourth, In combination with the arms, F, the lever, N, attached to the main frame, A, and provided with the curved bar, l, placed in such relation with the arms as to operate as and for the purpose set forth.

[This invention relates to certain improvements in that class of raking attachments for harvesters in which the rake and beaters, in passing over the platform, describe the arc of a circle in a horizontal plane. The object of the invention is to apply this class of raking device to the machine in such a way as to admit of the use of a driver's seat on the machine and also to admit of the regulating of the rake and beaters as regards the hight of the movement over the platform and the perfect adaptation of the former to the latter as circumstances may require.]

342.—Ross Winans and Thomas Winans, of Baltimore, Md., for an Improved Packing for Stuffing Boxes:

We claim a compound packing brick, substantially such as described as a new article of manufacture.

343.—W. H. Beach, of Chicago, Ill., assignor to J. S. Beach, of Ballston Spa, N. Y., for an Improved Machine for Swaging Sheet Metal:

I claim the pressure bar or plunger, C, provided with the bars or female dies, D D, in connection with the stationary bedpiece, b, and movable male dies, H H, the bar or plunger, C, and dies, H H, being operated by the screws, F I I, or their equivalents, and all arranged as and for the purpose set forth.

I further claim in combination with the bar or plunger, C, bedpiece, b, and the dies, D D H H, the punches and countersinks, G, arranged essentially as and for the purpose set forth.

344.—P. J. Clark (assignor to S. S. Clark), of West Meriden, Conn., for an Improvement in Skate Fastenings:

I claim, in combination with the plate, A, and slides, E E, and their pivoted and removable fastenings, F F, as described, the right and left hand screw, G, and restraining nut, d, for drawing said fastening up tightly to the boot or shoe and for drawing up the clamps and instep strap together; the whole being arranged under the ball of the foot substantially in the manner and for the purpose set forth and explained.

345.—Phylander Daniels, of Le Roy, N. Y., assignor to himself and S. H. Barnes, of New York City, for Improvements in Tanning Leather:

I claim, in tanning leather, the use of tormentilla and nutgalls in connection with cutch or terra japonica, in about the proportions set forth.

I also claim, in tanning leather with the above-designated substances, the within-described method or process, to wit:—The application, first, of a solution of cutch, tormentilla and nutgalls in the proportions and strength specified, the subsequent addition of the salts specified, and the ultimate strengthening of the liquor to the proper degree to complete the tanning, by the addition of a strong solution of cutch or terra japonica alone.

346.—G. J. Hill (assignor to Sanford, Harroun & Co.), of Buffalo, N. Y., for an Improvement in Machines for Numbering Railroad Tickets:

I claim, first, Imparting to the pall, S, a lateral movement to and fro, by means of mechanism, substantially as described, so that the pall will strike and move the 1st, 2d and 3d type wheels, as required, for printing numbers consecutively from 1 upward to 999.

Second, Hinging the type teeth, 1 2 3 4, &c., to the 3d type wheel, for the purposes and substantially as set forth.

Third, A recess formed in the annular rim, h, and spring, j, in connection therewith, in combination with the spring, J, and hinged type of the 3d type wheel, for the purposes and substantially as described.

347.—A. H. Hook (assignor to the Grover & Baker Sewing Machine Company), of New York City, for an Improvement in Sewing Machines:

I claim the combination of two washers, concave at the center and rounded off at the outer edge, with a center pin and any suitable means to give these washers a pressure, causing the thread to be pinched between said washers, arranged substantially as and for the purpose specified.

348.—L. P. Jenks, of Boston, Mass., assignor to W. S. Murray, of New York City, for an Improvement in Filters:

I claim, in cases of a conoidal form, as described, the combination and arrangement of one or more bunches of fibers placed in a perforated

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groove or grooves, and alternately compressed or expanded, for the purpose of filtrating water or other liquids, all as set forth.

349.—Josee Johnson, of New York City, assignor to himself and John Ward, Jr., of Brooklyn, N. Y., for an Improved Folding Table:

I claim the combination and arrangement of the top, A, center piece, B, hook buttons, E, or other suitable fastenings and leg pieces, C, hinged together so that they may be readily folded into a small compass, substantially in the manner and for the purpose described.

350.—Stephen Johnson, of Cold Springs, N. Y., assignor to himself and L. E. Damon, of Napoli, for an Improvement in Seed Planters:

I claim the described arrangement of the cups, G, disk, F, and hopper, H, within the cylinder, C, the same being arranged and used in connection with the plow, K, and coverer, J, which are supported by the hinged lever bar, L, with flexible tube, I, the whole arranged and operating, as set forth.

351.—M. C. Longacre (assignor to himself and R. R. Herrick), of Cleveland, Ohio, for an Improved Churn:

I claim rotating the body of the churn in a vertical position by means of the disk, C, or its equivalent, when connected with the stationary dashers, L, arranged as described, for the purpose of adjusting the same both vertically and horizontally, as specified.

352.—J. L. Rowe, of New York City, assignor to Manning Merrill, of New York City, and Thomas Holmes, of Brooklyn, N. Y., for an Improvement in Nosings for Locks:

I claim the employment of a yielding or sliding segment in the nosing or staple for locks and latches to take the latch, in the manner and for the purposes substantially as specified.

353.—Coleman Sellers (assignor to himself and G. Burnham), of Philadelphia, Pa., for an Improvement in Exhibiting Stereoscopic Pictures of Moving Objects:

I claim combining with the stereoscope a series of pictures arranged in succession, as described, when said pictures revolve on an axis at right angles or nearly so to the line of vision, the whole being constructed and operated substantially in the manner and for the purpose set forth.

354.—E. M. Stevens (assignor to himself and L. L. Tower), of Boston, Mass., for an Improvement in Machines for Winding Thread:

I claim the combination and arrangement of the adjustable plate worm gear, H, and its return screw, K, or their equivalent or equivalents, with the cam wheel, G, and the cam, F, applied to operate the thread carrier, substantially as specified.

355.—S. B. H. Vance (asignor to Mitchell, Vance & Co.), of New York City, for an Improved Electrical Apparatus for Lighting Gas:

I claim, first, The employment or use of a portable electric machine, D, such as described, in place of the lamp, candle, taper, or other match generally used for the purpose of lighting gas.

Second, The arrangement of the cups, a, or their equivalents, to operate in combination with the pointed hooks, B, burners, A, and with the electric machine, D, in the manner and for the purpose specified.

Third, Giving to a portion of the rod, b, the form of a spiral spring, as and for the purpose set forth.

[The object of this invention is to arrange each burner by means of a cup, hook or other device, in such a manner that a portable electric machine can be used for lighting the gas emanating from each burner separately, or in other words, so that the portable electric machine can be used in place of the lamp, wax taper or other match generally used for lighting the gas.]

356.—H. S. Walcott, of East Boston, Mass., assignor to Samuel Eter, of Boston, Mass., for an Improved Carpet Tack Driver:

I claim, first, The perpendicular spring hammer rod, B, and lever, C, in combination with the frame, A A1 A2 A3, substantially as set forth.

Second, In combination with the hammer rod, B, and lever, C, the jointed toe piece, C', and grooved collar, g, arranged and operating substantially as and for the purposes set forth.

Third, The pivoted spring tack holding jaws, a a, in combination with hammer rod, B, as described, for receiving and properly holding the tack until it is struck by the hammer rod.

357.—Ichabod Washburn (assignor to himself and P. L. Moen), of Worcester, Mass., for an Improvement in Hardening and Tempering Wire:

I claim an apparatus for tempering steel wire, or other steel, in pieces of considerable length, composed of two furnaces, A B, each of which contains a bath, C or D, of fusible metal or alloy, and an interposed quenching bath, E, the whole constructed and arranged substantially as described, to enable the hardening and tempering to be performed at one operation without exposure of the steel to direct contact with the fire.

[The object of this invention is to harden and temper steel wire, or other steel, in pieces of considerable length by one continuous operation, without any danger of exposing it to so high a temperature as to produce oxydation or other injury. This invention consists in an apparatus composed of two frames, each of which contains a bath of lead, or other metal, or alloy fusible at temperatures below what are required for hardening and tempering, through which the steel passes without immediate contact with the fire, and a bath of oil or water interposed between said furnaces. The steel is passed through the metal in the bath of one furnace and heated, then through the bath of oil or water by which it is cooled and hardened, and afterward through the metal bath of the other furnace, by which it is again heated, to reduce its hardness to the desired temper.]

358.—Suspended.

RE-ISSUES.

29.—Sewall Brackett, of Fall River, Mass., for an Improved Knife and Fork Cleaner. Patented April 10, 1860:

I claim my improved scouring machine as composed of the two rollers, B B, the trough, A, the auxiliary or scouring and counteracting rollers, B' B', and the four connecting gears, D D D D, or mechanical equivalents for such gears, arranged and combined substantially in the manner and so as to operate together as specified.

30.—Christian Reif, of Hartleton, Pa., for an Improvement in Clover Separators. Patented August 8, 1854:

I claim the employment of a cast metal bed or concave, in which the angular projections on its face, as described, furnish one of the rubbing surfaces, when used with a revolving cylinder, A, armed with spikes, constructed in the manner and for the purposes set forth.

I claim the described arrangement of sieves, H and q, and carriers, I and J, for cleaning clover seed, substantially as fully set forth.

31.—D. S. Wagener, of Penn Yan, N. Y., for an Improvement in Flouring Mills. Patented Sept. 25, 1855:

I claim, in combination with a grinding mill, the feeding of the grain through or past a suction draft, interposed between the hopper and the grinding surfaces of the stones, for the purpose of removing from the grain the dust and other impurities in it, substantially as described.

DESIGNS.

R. Allan, of Camden, N. Y., assignor to A. Smith, of West Farms, N. Y., for a Carpet Design.

E. J. Ney, of Lowell, Mass., assignor to the Lowell Manufacturing Company, for a Design for Carpets (2 cases).

J. D. Warren, J. B. Scofield, Isaac Wardwell and A. T. Jones, of Stamford, Conn., for a Design for a Stove.

NOTE.—The above list contains the claims of SEVENTY-EIGHT patents which were granted on the 5th inst., being the work of the Examiners, Revising and Appeal Boards for the week previous. Out of this number of patents granted, THIRTY-FOUR—nearly one-half of the entire issue—were solicited through the Scientific American Patent Agency.

Notes and Queries

S. W. L., M. D., of Ohio.—A pill can be sugar-coated by dipping it into strong sirup, and allowing it to dry; or it may be moistened and rolled among dry sugar. An india-rubber belt may be united where it is broken by a cement formed of india-rubber dissolved in naphtha. Scarf the ends of the belt, so that the surfaces may be laid upon one another to form a level face; then apply the cement hot, lay the ends smoothly upon one another, and submit the belt to pressure. By adding some common copal varnish to dissolved india-rubber, its adhesiveness is improved, and it becomes capable of cementing leather.

W. T., of R. I.—There have been several plans invented for indicating the speed of ships, entirely different from the common log and line. A number of these have been described in the SCIENTIFIC AMERICAN. You will find a description of one on page 410, Vol. IX., old series.

C. C. C., of Conn.—The fact of sheets of postage stamps having been perforated in the way you describe would prevent the adaptation of the same thing to checks, &c., being patented. The difference between the two is a mere difference of size and purpose, which does not constitute invention.

A. S., of Cuba.—We have received your interesting letter in relation to spiders. Popular opinion is a very different thing from authentic observation.

A. R. W., of Pa.—The business of the Patent Office is going on uninterruptedly, and cases are being examined with the usual dispatch. Secession does not affect this business in the least.

D. Q., of Pa.—The rule of the Patent Office respecting models is that it "must be neatly and substantially made, of durable material, and not more than one foot in hight or length, except when a larger model is permitted by the Office for some special reason," a privilege rarely granted.

H. W. D., of Pa.—Our pamphlet of advice contains as explicit an answer to your inquiry as it is possible to give. We therefore advise you to send for one. We charge nothing for them; all we want is simply your address, which you need not be ashamed to give.

E. C. C., of Mass.—Your steam trap seems to be a very good thing, but we have doubts about its novelty, and would advise a preliminary examination.

R. L. S., of N. Y.—Your improvement in looms appears to be new, and we have not much doubt of its patentability. A vast number of improvements have been made in looms, as you are probably aware; still we have seen nothing like yours.

J. M. V., of Mo.—We think a patent can be obtained on your breech-loading cannon. It appears to be a very good arrangement. We would advise you, however, to make experiments upon it. We would also suggest a preliminary examination into its novelty, at the Patent Office, before incurring the expense of an application.

W. N. T., of Pa.—In Cornwall, a reverberatory furnace is employed for smelting tin ores. It is the most economical as to fuel. The tin ore is mixed with about three-quarters of its weight of powdered charcoal or anthracite, and a very small quantity of slaked lime, to serve as a flux, and is smelted on the hearth of the furnace.

R. M. H., of Mass.—Barometers do not always indicate the changes of weather within twelve or even five hours. A good barometer, however, is almost as useful to a farmer as a clock. The aneroid barometer is a cheap and good one, and can be obtained of J. Kendall, of New Lebanon, N. Y.

P. W., of N. Y.—India-rubber can be dissolved in pure turpentine. Naphtha will also dissolve it; so will benzole and bi-sulphide of carbon. You can easily make the rubber cement desired, with this information.

H. B., of Fa.—A very strong solution of isinglass is the best substance which you can use for cementing leather belts

W. R. P., of Conn.—The best agent you can employ for browning gun barrels is the tincture of iodine. Use it diluted with half its bulk of water; apply it to the surface of the barrel with a clean rag; allow it to stand for about six hours, then brush the metal, rub it over with some beeswax dissolved in turpentine, and it is done.

L. B. G., of N. Y.—On page 71 of the present volume of the SCIENTIFIC AMERICAN you will find the description of an aquarium, and the information you desire.

E. A. H., of Ill.—We do not know anything of Collender's lamp. In regard to the platinum gauze, you had better address Dr. Chilton, Prince-street, New York. Hydrogen gas, when burned or combined with oxygen, produces the largest heat of any gas known, and it will therefore require more hydro-carbon or coal gas to produce the same heat or the same light with an incandescent body.

F. D., of N. Y.—C. Morfitt's work on tanning is the only one published on the subject in this country, so far as we know. It can be obtained of John Wiley, publisher, this city.

W. W. B., of Pa., J. S. D., of N. H., C. B. T., of C. W., and W. J. & Co., of Ohio.—Your articles have been received and will be duly considered.

G. H., of Conn.—The acetate of lead is a common and cheap article of commerce. It is used for dyeing as a mordant; also as a base and drier for some paints. The acetates of zinc and nickel are not so common, but any chemist will make samples of them for you.

E. H., of Pa.—There is no work published treating exclusively of valve motions, but D. C. Clark's work on locomotives contains the information which you want.

H. C. E., of Mass.—A solution of oxalic acid is the best chemical eraser for black ink known to us. We do not understand the meaning of your questions respecting sulphur and marking the walls of rooms.

S. C., of Va.—Gray's mode of setting ship's compasses to obviate local attraction, is by placing a battery of permanent fixed magnets in such a position as to control the proper action of the "needle." The American patent of Calvin Kline is older than that of Mr. Gray's English one, and embraces the same principle.

Money Received

At the Scientific American Office on account of Patent Office business, for the week ending Saturday, Feb. 9, 1861:—

R. F. H. H., of N. J., $300; J. B. C., of Pa., $25; G. H., of Ind., $55; A. H. J., of U. T., $30; F. & O., of N. Y., $20; A. S., of Ohio, $25; J. B. L., of Md., $30; E. D., J., of Conn., $25; D. B., of Mo., $38; T. J. L., of Pa., $25; D. C. C., of N. Y., $32; B. D., of N. Y., $250; D. L., of N. Y., $30; S. K. W., of N. Y., $25; W. N., of Mass., $30; N. F., of Wis., $25; W. & S., of Ohio, $30; J. G. C., of Pa., $50; M. K. M. Co., of N. Y., $145; B. F. H. H., of N. Y., $50; D. C. W., of N. Y., $25; G. S. L., of Pa., $25; O. F. B., of N. Y., $35; L. F. A. L., of Cal., $35; H. B. & J., of Iowa, $55; C. N. B., of Pa., $30; J. E. T., of La., $350; G. N. C., of Conn., $30; R. W., of Pa., $22; F. W. P., of Mass., $20; W. & G., of Mich., $10; T. S. W., of Pa., $55; E. G., of Mass., $15; L. & K., of Iowa, $60; J. A. De B., of N. Y., $30; C. T. S., of N. Y., $25; B. F. C., of Ky., $60; E. J. Y. P., of Mexico, $325; A. A. B., of N. Y., $25; A. C. M., of Vt., $30; C. J., of N. Y., $30; M. J., of Mass., $30; A. H. S., of Ga., $55; C. M. L., of Ohio, $30; E. & M., of N. H., $30; C. C., of N. Y., $30; E. C., of N. Y., $30; C. W., of Iowa, $30; J. O., Jr., of N. H., $18; B. & B., of Ind., $30; J. H., of Ohio, $30; H. W. M., of Ill., $30; A. P., of N. Y., $58; J. T. D., of N. Y., $58; C. W. W., of Mass., $25; B. P. C., of N. Y., $30; J. B. L., of Md., $25; C. T. P., of N. Y., $250; S. M. & Co., of Vt., $225; A. C. M., of Vt., $28; S. & B., of N. Y., $30; T. C. Z., of Pa., $25; G. I., of Mich., $30; C. & C., of N. Y., $35; E. C., of Conn., $28; T. S. M., of Ohio, $30.

Specifications, drawings and models belonging to parties with the following initials have been forwarded to the Patent Office during the week ending Feb. 9, 1861:—

W. H. McN., of N. Y.; A. S., of Ohio; J. G. C., of Pa.; J. McC., of Ala.; J. C. B., of N. Y.; S. K. W., of N. Y.; J. J. H., of Ky.; C. B. W., of N. Y.; J. T. D., of N. Y.; A. P., of N. Y.; J. B. C., of Pa., A. A. B., of N. Y.; T. D. J., of Mich.; W. G. R., of Mass.; J. P., of Texas; E. J. Y. P., of Mexico; G. S. L., of Pa.; D. C. W., of N. Y.; J. O., Jr., of N. H.; D. B., of Mo.; T. J. L., of Pa.; W. H. N., of N. Y.; T. C. Z., of Pa.; F. S. S., of Conn.; O. F. B., of N. Y.; N. F., of Wis.; C. & C., of N. Y.; G. I., of Mich.; D. C. C., of N. Y.; E. D. S., of Conn.; C. T. S., of N. Y.; J. B. L., of Md.

New Books and Periodicals Received.

BLACKWOOD'S MAGAZINE.—Published by Leonard Scott & Co., No. 54 Gold-street, New York.

The number of this magazine for the present month commences a new volume, and starts off with the vigor of youth at 44 years of age. It contains nine vigorous original articles, chiefly political.

THE WESTMINSTER REVIEW.—Republished by Leonard Scott & Co., No. 54 Gold-street, New York.

The article in the January number on "What Becomes of Alcohol in the System?" shows that the "Westminster" is second to no other publication in the high character of its articles on science.

RATES OF ADVERTISING.

Thirty Cents per line for each and every insertion, payable in advance. To enable all to understand how to calculate the amount they must send when they wish advertisements published, we will explain that ten words average one line. Engravings will not be admitted into our advertising columns; and, as heretofore, the publishers reserve to themselves the right to reject any advertisement sent for publication.

IMPORTANT TO INVENTORS.

THE GREAT AMERICAN AND FOREIGN PATENT AGENCY.—Messrs. MUNN & CO., Proprietors of the SCIENTIFIC AMERICAN inform their patrons that they are still engaged in preparing specifications and drawings and attending to the wants of inventors in every department before the Patent Office, such as Extensions, Appeals, Interferences, correcting imperfect papers submitted to the Patent Office by incompetent persons, examining into the novelty of inventions, arguing rejected cases, &c. The long experience Messrs. MUNN & CO. have had in preparing specifications and drawings, extending over a period of sixteen years, has rendered them perfectly conversant with the mode of doing business at the United States Patent Office, and with the greater part of the inventions which have been patented. Information concerning the patentability of inventions is freely given, without charge, on sending a model or drawing and description to this office.

Consultation may be had with the firm, between NINE and FOUR o'clock, daily, at their PRINCIPAL OFFICE, No. 37 PARK-ROW, NEW YORK. We have also a BRANCH OFFICE in the CITY OF WASHINGTON, on the CORNER OF F AND SEVENTH-STREETS, opposite the United States Patent Office. This office is under the general superintendence of one of the firm, and is in daily communication with the Principal Office in New York, and personal attention will be given at the Patent Office to all such cases as may require it. Inventors and others who may visit Washington, having business at the Patent Office, are cordially invited to call at their office.

Messrs. MUNN & CO. are very extensively engaged in the preparation and securing of Patents in the various European countries. For the transaction of this business they have Offices at Nos. 66 Chancery Lane, London; 29 Boulevard St. Martin, Paris; and 26 Rue des Eperonniers, Brussels. We think we may safely say that seven-eighths of all the European Patents secured to American citizens are procured through our Agency.

Inventors will do well to bear in mind that the English law does not limit the issue of patents to inventors. Any one can take out a patent in Great Britain.

A pamphlet of information concerning the proper course to be pursued in obtaining patents through their Agency, the requirements of the Patent Office, &c., may be had gratis upon application at the Principal Office, or either of the Branches. They also furnish a Circular of Information about Foreign Patents.

The annexed letters, from the last three Commissioner of Patents, we commend to the perusal of all persons interested in obtaining Patents:—

Messrs. MUNN & Co.:—I take pleasure in stating that, while I held the office of Commissioner of Patents, MORE THAN ONE-FOURTH OF ALL THE BUSINESS OF THE OFFICE CAME THROUGH YOUR HANDS. I have no doubt that the public confidence thus indicated has been fully deserved, as I have always observed, in all your intercourse with the Office, a marked degree of promptness, skill and fidelity to the interests of your employers. Yours, very truly,

CHAS. MASON.

Immediately after the appointment of Mr. Holt to the office of Postmaster-General of the United States, he addresssed to us the subjoined very gratifying testimonial:—

Messrs. MUNN & Co.:—It affords me much pleasure to bear testimony to the able and efficient manner in which you have discharged your duties of Solicitors of Patents while I had the honor of holding the office of Commissioner. Your business was very large, and you sustained (and, I doubt not, justly deserved) the reputation of energy, marked ability and uncompromising fidelity in performing your professional engagements. Very respectfully,

Your obedient servant, J. HOLT.

Messrs. MUNN & Co.:—Gentleman: It gives me much pleasure to say that, during the time of my holding the office of Commissioner of Patents, a very large proportion of the business of inventors before the Patent Office was transacted through your agency, and that I have ever found you faithful and devoted to the interests of your clients, as well as eminently qualified to perform the duties of Patent Attorneys with skill and accuracy. Very respectfully,

Your obedient servant, WM. D. BISHOP.

Messrs. MUNN & Co. cordially invite persons visiting the city, or residents, to call at their spacious offices, No. 37 Park-row, and examine the models which are on exhibition, or refer to the works of reference contained in their library, access to which can be had at all hours.

Inventors can communicate in German, French, Spanish, or nearly any other language, in soliciting information from this office. Circulars of information regarding the procuring of patents, printed in German, may be had on application.

Communications and remittances should be addressed to

MUNN & CO.,

Publishers, No. 37 Park-row, New York.

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THE GRAEFENBERG THEORY AND PRACTICE OF Medicine.—On the first day of May, 1860, the Graefenberg Company's Salesrooms, Consulting Offices and Medical Institute were removed from No. 34 Park-row to

NO. 2 BOND-STREET, NEW YORK,

(first door from Broadway), in order to afford greater facilities and a more central location, demanded by the rapid increase of confidence in the Graefenberg Theory and Practice. The Graefenberg Theory and Practice, and the use of their medicines, together with complete symptoms of all diseases incident to this country and climate, the best method for their prevention and cure, will be found in the GRAEFENBERG MANUAL OF HEALTH.

This valuable family medical work, containing 300 pages, has been revised and improved, and elegantly illustrated with beautifully colored engravings of the human system. Sent by mail to any part of the country on receipt of 25 cents. It is a complete guide to all diseases and their cure. Address JOSHUA F. BRIDGE, M. D.,

Resident and Consulting Physician Graefenberg Co.,
No. 2 Bond-street, New York.

One of the leading journals says of the "Graefenberg Manual of Health:"—"This is the only medical book for family and general use ever published. It is written in plain language, free from scientific terms, and condenses more practical medical information than can be obtained anywhere else, unless a regular course of medical education is undergone. The popularity of this admirable and compendious work is well shown by this being the Twenty-fourth edition. It contains a number of colored anatomical plates, and is a complete family physician. It is at once simple, popular, plain and explicit; and the mother, with such an adviser, is prepared at once to apply the proper remedies in case of sudden sickness in the family. In the country, a copy of the 'Manual of Health' is indispensable, and every family should possess one. It will save a hundred times its cost in doctors' bills, and what is far better, will be the means of preserving many valuable lives to their families and relatives." leowtf

POPULAR LECTURES BY DISTINGUISHED MEN.—These lectures have lately appeared in the following numbers of the HOUSEHOLD JOURNAL, any of which can now be had at the price of three cents each:—

"Man and Climate," by Bayard Taylor, in No. 20.
"A Day in the Alps," by Rev. T. L. Cuyler, in No. 21.
"Little Things," by Rev. Dr. Storrs, in No. 19.
"The Equatorial Regions in Africa," by M. DuChaillu, in No. 18.
"Life in the Arctic Regions," by Bayard Taylor, in No. 16.
"Social Responsibilities," by John B. Gough, in No. 12.
"Young America," by Rev. H. W. Beecher, in No. 11.
"Brazil and the Brazilians," by Rev. J. C. Fletcher, in No. 10.

The foregoing lectures were all reported by one of the best phonographic writers specially for the HOUSEHOLD JOURNAL, in which they have appeared exclusively and in full. They will be followed, each week, by others equally instructive and interesting. Amongst others which will appear shortly are the following:—

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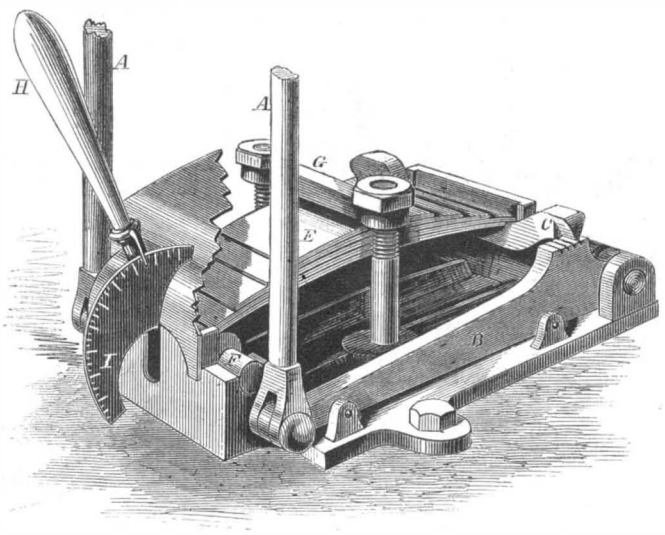
The want of some convenient and expeditious means of reducing the load on the safety valves of locomotives has long been felt. With the spring balance in common use, the nut, constituting the only means by which the load can be varied, requires to be turned so far to effect any considerable reduction of the load, and the operation is so tedious that engineers, when compelled to stop for a time, will often neglect to reduce the load, as it is their duty to do on such occasions, or will fail to reduce it as much as they ought. The object of the invention here illustrated is to enable the load on the valve to be conveniently and instantaneously reduced by the engineer as much as may be desirable. To accomplish this a spring is employed, the pressure of which may be largely varied by a small range of the adjusting motion. The spring preferred by the inventor is that known as the semi-elliptic, which is arranged in the manner represented in the engraving.



GRAHAM'S SPRING BALANCE FOR SAFETY VALVES.

The rods, A A, are attached at their upper ends to the safety valve, or to a lever which presses the valve down, and at their lower ends to the levers, B. The levers, B, have their fulcra at their ends opposite to the ends with which the rods, A A, are connected, and near their fulcrum ends they support the crossbar, C, the knife blade edge of which rests in notches upon the levers, B. The semi-elliptic spring, E, has one end resting upon the bar, C, and the other upon the eccentric roller, F, while it is held down in the middle by the bar, G. The eccentric roller, F, is provided with a handle, H, by which it may be turned, and the end of the spring, E, which rests upon it may be pried up with great force, thus pressing down its opposite end with corresponding force, and through the levers, B, and rods, A A, increasing the load upon the safety valve. On the contrary, turning the roller, F, so as to lower the end of the spring, E, which rests upon it, diminishes the load upon the safety valve. To the handle, H, is attached a pointer or index which traverses along the arc, J, this arc being graduated to indicate the load upon the valve. The friction of the spring, F, keeps the eccentric roller in any position to which it may be turned. A stop is fixed for the handle, H, so that it will be impossible for the engineer to exceed the permitted weight upon the valve.

It will be seen that, with this spring, arranged as represented, the load on the valve may be reduced with a single motion of the hand in the briefest possible time, or it may be increased to any desirable point with the greatest convenience and facility.

The patent for this invention was granted, through the Scientific American Patent Agency, Dec. 18, 1860, and further information in relation to it may be obtained by addressing the inventor, Charles Graham, at Scranton, Pa.

Self-winding Clock.—We take the following notice from the Utica *Herald*:—"The most novel invention on exhibition is certainly the air self-winding clock of R. Hitchcock, of Watertown. If not perpetual motion itself, it is as near it as approach is likely to be made. We understand the model ran eight months without winding or repair, and was then taken down for removal to the Patent Office. The motive power is obtained from a wheel placed in the ventilator of the room, where a sufficient current is always found; this, connected with the clockwork, keeps it continually wound up. So satisfactory is the working of the principle, and so confident are experienced mechanics of its practical value, that the Boston Watch Company are manufacturing a large number of the clocks."

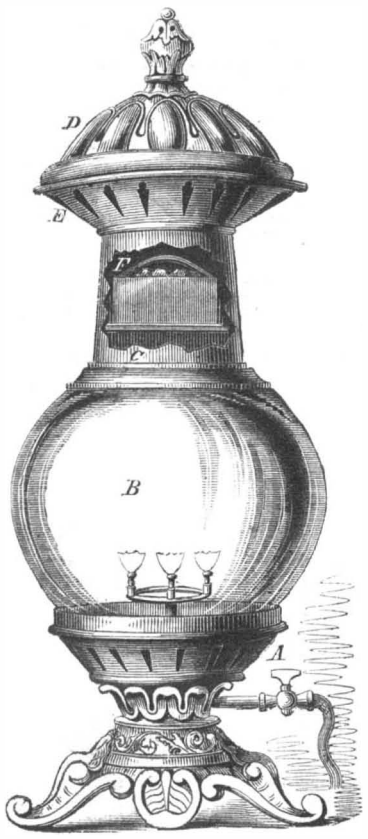
The loans of one single banking-house, in London, exceed $150,000,000 per annum, and twenty bankers now clear £1,000,000,000, or $4,800,000,000, a sum almost past comprehension. The value of real property in the city, insured against fire, though probably not 50 per cent is annually insured, amounts to a sum at least of $290,000,000.

Nibbs' Light and Heat Generator.

For obtaining the most light from illuminating gas it requires to be burned under entirely different conditions from those usually employed when the object is to obtain heat alone. Nearly all the light comes from particles of carbon while they are floating in the escaping gas, after they are heated and before they are burned. Now, as, when they are hot enough, they burn the instant they come in contact with the oxygen of the air, in order to obtain the most light it is best to keep them floating in the body of the flame as long as possible. The arrangements adopted to effect this almost always result in the escape of a portion of the carbon unconsumed.

On the other hand, when the object is to procure all the heat possible from the burning of the gas, all that is requisite is to secure its complete combustion. In order to accomplish this the escaping gas is divided into minute jets, by passing it through a wire netting or through sand, in order to bring it into the most perfect contact possible with the oxygen of the air.

The object of the invention here illustrated is to complete the combustion of the carbon after it has fully performed its office of giving off light, by bringing



t into contact with an ample supply of hot air in the top of the chimney. The gas is admitted to the burners through an ordinary gas tap or union joint. There may be one, two or more burners, according to the size of the apparatus. The atmospheric air is admitted through apertures at A. The gas flames are enclosed by a thick globe of glass, B. The air, after passing at A, enters the dome or head, D, where, becoming intensely heated, it expands and fills the dome, which, becoming overcharged, allows a portion only to escape through the openings, E, the head, D, thus acting as a kind of reservoir for heated air. In its passage upwards, the air strikes against the metal plate, F, and is deflected to its edges, and passes through narrow apertures between the pipe and plate. The top, E, may be removed and another of different form substituted for boiling, frying, &c. It will be seen that, by this apparatus, the light and heat-giving powers of the gas may both be fully utilized.

An Expensive Suit for Twenty Cents.—Mr. David Phillips has just recovered a verdict of six cents from Mr. Michael Martin, a conductor on the Hudson River Railroad, for ejecting him from the cars in consequence of a refusal to pay his fare. The original sum in controversy was but twenty cents, and already the costs of the suit have reached $1,000. The case is to be appealed.

The term magnetism is derived from Magnesia, the name of a city in Asia, near which lodestone was first found.

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